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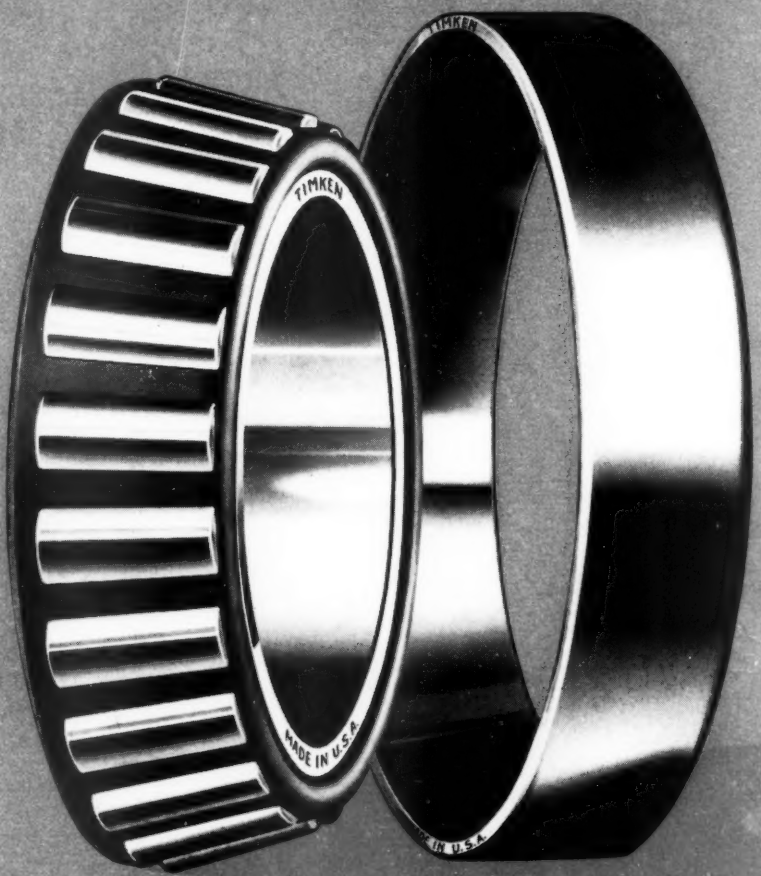

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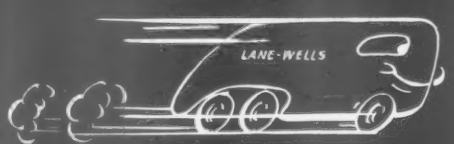

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Table of Contents

NEWS DEVELOPMENTS

Sale of 100-Octane Plants to Private Industry Recommended 52
Wage Panel Suggests 18 Per Cent Increase for Refineries 53
Desulfurization Project Planned for Poza Rica Field 54
PAW Seeks Increased Burning-Oil Ceiling 54
SPA Urges Retention in Oil Service of Big-Inch Lines 56
Ralph Gallagher Joins J. P. Morgan & Co. 57
Gasoline Prices Reduced in Weakening Market 58
72 Per Cent of U. S. Wells Are Strippers 59
PAW Team Sticks Together 66
California Standard East Coast Marketer 69
Deaths in the Industry 69

Editorial 51
This Week 55
International News 63
Natural-Gas News 111
Natural-Gasoline News 111
Refining News 112
Pipe-Line News 114
Statistics and Trends 116

ENGINEERING AND OPERATING

Drilling Operations in Rangely Field 70
Interpretation of Laboratory Analytical and Volumetric Data 75
New Pipe-Line Construction Methods on Great Lakes Project 82
Thoria-Alumina Catalyst Best for Isoparaffin Synthesis 86
The Optimum Rate of Production—Part 21 90
Portable Laboratory Pumps 95
Questions on Technology 97
The Refiner's Notebook 99
Engineering Fundamentals 101
Oil and Gas Equipment Digest 107

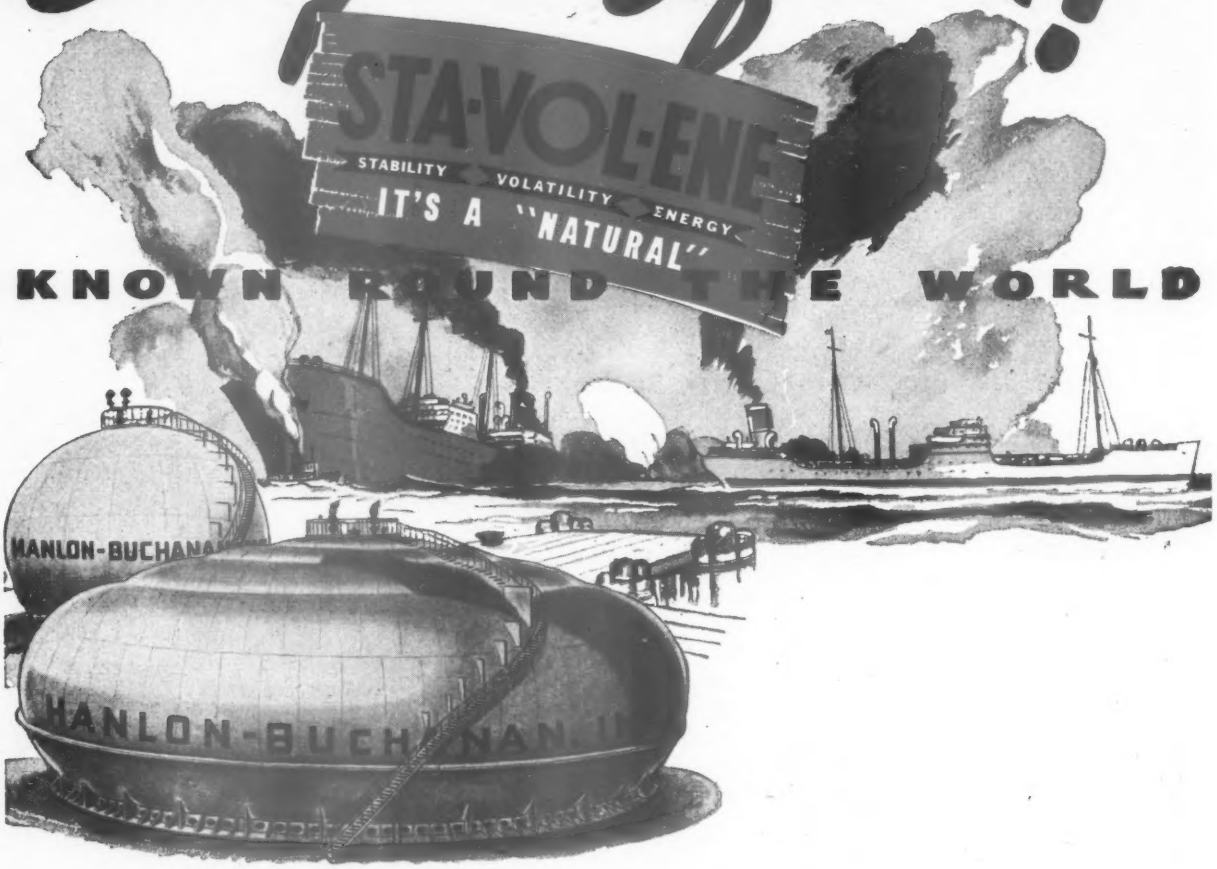
EXPLORATION AND DRILLING

Weekly Well-Completion Record 116
Daily Average Production for Week 117
Prospects for 1946 Are Confused 119
Reports by Areas Start on Page 119

ADDITIONAL FEATURES

Market Summary 116
Drilling Contractors 132
Personals 134
Classified Advertising 137
Events on the Calendar 140
Advertisers' Index 140

Cargoes Afloat!



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Fact Finding

NO more confounding report has come out of Washington than that released Saturday by the presidential fact-finding board recommending an increase of 18 per cent in the wages of 25,000 CIO refinery workers, most of whom last October walked away from their jobs in violation of the unions' agreements with employers.

The recommended advance follows closely the agreements entered into between a few employers and local unions in which the employes accepted the 18 per cent increase. Thus the board members waited until they found out what the unions would accept and then applied it to the pending labor disputes—a complete victory for those who dictate union policies.

In explanation of the advance the board pointed to the increase in the cost of living, the return to the 40-hour week and the ability of employers to pay.

So the oil business has this antithesis posed by its Government. OPA insists prewar oil prices must continue in effect because costs have not increased and higher schedules would be inflationary. But a presidential board, presumably with broader view than a single agency, approves a substantial increase in wages following wartime upward adjustments in the same industry on the ground that the cost of living has advanced—a figure of 33 per cent being used in recent discussions.

Thus one building in the nation's capital continues to beat the drums of anti-inflation regulations while another says in effect that the whole program of price ceilings has been generally ineffective and farcical in its assumptions and should be ignored in solving current labor difficulties.

Then comes the most amazing contention of all, that refiners should advance wages because they have the wherewithal to pay the increases. Out goes the traditional policy, dating back to the beginnings of organized labor, of equal pay for equal work. The reasoning, when any is offered in support of this latest effort to evade fundamental issues, is so superficial that the union leaders themselves probably do not consider it anything more than a temporary weapon to hurl at befuddled Washington. These union officials realize that employes, even more than employers or consumers, would be the ultimate losers in a wage policy based on changes in the business cycle.

As to wage scales, the refiners' position is clear. For years, according to Department of Labor reports, the hourly, weekly, and yearly rates at their plants have been higher than in any other major manufacturing industry. Operators have no desire to change this position, but they do resent being made the victims of a vacillating government policy founded, not on facts, but on political expediency.

Sale of 100-Octane Plants to Private Industry Recommended

by Henry D. Ralph

WASHINGTON.—Government-owned aviation gasoline facilities, for the most part, have little use except to their present operator-lessees, and should be sold promptly as operating entities wherever possible, the Surplus Property Administration concludes in a report to Congress on disposal of 100-octane installations.

Dismantling for salvage should be undertaken only as a last resort, it is recommended, although SPA states that many of the facilities have doubtful peacetime value. Neither is any need found to maintain the plants in stand-by condition for a possible future emergency.

The SPA conclusions pretty much agree with the report on surplus 100-octane facilities submitted to the O'Mahoney committee of the Senate by a special industry group, particularly as to the technological and economic factors governing their future use.

The question of monopoly and concentration of industry, which must be considered under terms of the surplus property law, raises no specia problems in disposal of these facilities, SPA reported, although sale of all of them to major companies would accelerate the trend toward concentration of refining capacity in the hands of large integrated concerns. Most of the facilities would be marginal or submarginal if operated in conjunction with a small refinery but might be economical units in large refineries, it is stated, while very small refineries could not make use of the government-owned equipment.

Octane Race Discussed

The "octane race," or trend toward higher quality motor gasoline, is discussed at some length, but the report concludes that very few of the government plants are so situated as to be very useful to small independent refineries in meeting this competition from the majors. "Freezing" the government-owned plants through a moratorium on their disposition, as recommended to the O'Mahoney committee by some independents, would be no answer to the problem of the independent refiner and would not materially affect the competition in gasoline quality, the report says, because the big integrated companies have privately-owned facilities in most cases more efficient and better adapted to the purpose than the government-owned equipment.

No single sales formula, such as cost-less-depreciation, can be applied to 100-octane facilities, but SPA recommends that the Government negotiate prices on the basis of appraisals of prospects for product markets, crude supplies, and other pertinent factors surrounding each plant. It is suggested that such information could best be obtained by leasing the plants for intermediate periods to obtain actual data on peacetime operations. The price should be based on the value of the plants to prospective purchasers, and SPA suggests that leases carry permission to reconvert the facilities and experiment with changes, keeping nonuseable equipment in stand-by conditon until final disposition.

Many Aspects Considered

The report gives full recognition to many aspects already pointed out by the oil industry, such as:

Government plants were built for special war purposes, with high construction costs, designed for selected crudes and for specific components of aviation gasoline, are not of uniform engineering pattern and performance, and include much equipment, such as alkylation and isomerization, of little or no use in peacetime operations.

Many large refiners built similar, or better, facilities with their own funds, often with lower construction costs and more advantageously located, and with the benefit of accelerated amortization allowances.

The country's capacity to produce aviation gasoline is some three times the prospective demand, but government-owned aviation plants as a group could not fill this demand and their costs would be higher than those of private plants; no independent refiner could compete with the large integrated companies in the aviation gasoline business because of the high product specifications and the widespread and flexible distribution facilities demanded by Army, Navy, and commercial airlines.

The only value of the government-owned facilities is in high-octane motor-gasoline production and their value for this purpose depends entirely on their usefulness to a prospective purchaser, considering such specific and local factors as type of crude or charging stock available, integration with other refinery activities, regional octane preference of motorists, and market outlets of the individual operator.

Most of the government plants are "scrambled," or so closely integrated with private refineries that they are of little use if separated from such facilities, and would have little salvage value if dismantled.

Rapid technological changes in the refining industry could make all the facilities obsolete within a short time, so prompt and final disposal would be to the best interests of the government.

Summary of Findings

In summarizing its findings, the SPA report stated:

"A major postwar problem concerns refiners having a crude oil charge capacity of less than 5,000 bbl. per day; but in many instances, because of the nature and size of the government-owned plants, the very small refiners could not effectively use these installations. Disposal of the plants to wartime lessee-operators (most of whom are independents) or to other independents, individually or in association, may provide a method by which the very small refiners can secure high-quality products which will satisfactorily compete with the products now being manufactured and marketed by major companies.

"Options exist in all contracts under which the plants were operated. In only four cases have the options been waived, and unless further waivers are obtained the options will prevent disposal of the plants to anyone except the lessee-operator until after the option termination date.

"Arrangements have been made in most instances by which the patented processes used in the aviation gasoline program will be licensed to purchasers or lessees of the government-owned plants. Final agreements have not been reached in connection with two types of cracking processes (TCC and Houdry). Barriers to reaching such agreements should be removed without delay.

"Either sale or lease involves certain risks. It is advantageous to sell immediately if possible where the objectives of the Surplus Property Act can thus be achieved and a price commensurate with the fair value of the facilities obtained. In considering sale, it must be recognized that most potential purchasers of government plants are relatively small, and in each case the period and terms of sale must be suited to the operator's financial status. In instances a leasing arrangement coupled with a purchase conversion privilege may meet the requirements of the operator and better assure full conformity with the objectives of the Surplus Property Act."

Wage Panel Suggests 18 Per Cent Increase for Refinery Workers

WASHINGTON.—An increase of 18 per cent in the straight-time hourly wage rates of employes in the refineries and pipe lines still under Navy seizure as a result of a strike was recommended to Secretary of Labor Lewis B. Schwellenbach by the three-man panel appointed by him to report on the wages to be paid on resumption of 40-hour work week.

The Oil Workers International Union (C.I.O.) had asked a 30 per cent increase and many of the companies had offered 15 per cent, but the union meanwhile has negotiated some individual contracts for an increase of 18 per cent.

The panel strongly urged adoption of its recommendations, and Secretary Schwellenbach declared the recommendation is sound and fair and provides the basis to speed conclusion of collective bargaining negotiations. The recommendation would increase the average hourly pay of employes affected from $1.20 to $1.41 per hour.

The fact that the union has settled some disputes for an increase of 18 per cent apparently was the major factor in the panel's conclusions, though it gave a number of other justifications for arriving at this figure, including increases in living costs, reduction in earnings on a shorter work week, general financial condition of the industry, and ability of the oil companies to absorb the wage scale without a price increase.

To maintain refinery workers' "take home" pay on the shorter work week would require an increase of 22 per cent in straight-time rates, the panel found. While the increase in the cost of living during the war has been officially determined at 33 per cent, the panel found that refinery workers have had an average increase of 21.6 per cent during the war and are therefore entitled to a further increase of 9.5 per cent in hourly rates on the basis of maintaining prewar living standards.

In addition, the panel recommended that a further increase of 8.5 per cent—making the total 18 per cent—would be "just and reasonable," saying that earnings of workers must be as high as is consistent with maintenance of the price structure and reasonable returns to the owners of industry. In rejecting the union demand for complete maintenance of "take home" pay with a shorter work week the panel quoted an address of President Truman to the effect that the wartime level of earnings cannot be maintained entirely on return to peacetime operations.

The panel made the following findings of facts and recommendations:

1. The average straight-time hourly earnings of the workers in 33 seized petroleum plants for which data were available, were 119.6 cents.

2. The petroleum industry is admittedly a high wage industry. The average gross hourly earnings of all manufacturing industries in July 1945 was 103.3 cents per hour. As of the same date the average gross hourly earnings of the petroleum industry was 128.1 cents per hour.

3. The actual work week as of July 1945 averaged 45.4 hours, and, on the basis of a schedule work week of 40 hours, the hours actually to be worked, according to a reasonable estimate, will average 39.1.

4. To the worker, whose average straight-time hourly earnings were 119.6 cents, this decline in hours would mean a drop in average weekly earnings from $58.36 to $47.77 or 18.1 per cent.

5. To restore these earnings though a change in basic wage rates would require an increase of 22 per cent.

6. Between January 1941 and July 1945 the straight-time average hourly earnings in the oil establishments which reported to the Bureau of Labor Statistics increased 21.6 per cent.

7. The regulations of the Office of Stabilization Administrator state that, for wage stabilization purposes, the percentage increase in the cost of living since January 1941 "shall be deemed to be 33 per cent."

8. An average wage increase of 9.5 per cent is required to compensate the workers in this dispute, as a group, for the difference between the increase in their straight-time average hourly earnings and the increase in the cost of living since January 1941.

9. A combination of considerations—less premium overtime pay, higher productivity, and settlements already negotiated through collective bargaining—indicate that an amount in excess of that due because of the increase in the cost of living should be granted.

10. This additional increase which, in the judgment of the panel, will be just and reasonable, should be 8.5 per cent beyond the 9.5 per cent clearly due as a cost of living adjustment, thus making a total increase of 18 per cent in basic wage rates. Based on these several factors an increase of 18 per cent in the basic wage rate in effect at the time of seizure of the plants and facilities is found to be the increase to be put into effect at the time of the resumption of the 40-hour week. In the judgment of the panel, the earnings of the workers must be as high as is consistent with both the maintenance of the stability of the price structure and the provision for reasonable returns to the owners of industry.

11. Several of the companies and the union in collective bargaining have determined the wage increase due on a percentage rather than on a cents per hour basis. The panel is not disposed to change this negotiated basis.

12. On the basis of the record the recommended increase of 18 per cent can be placed in effect without a price increase.

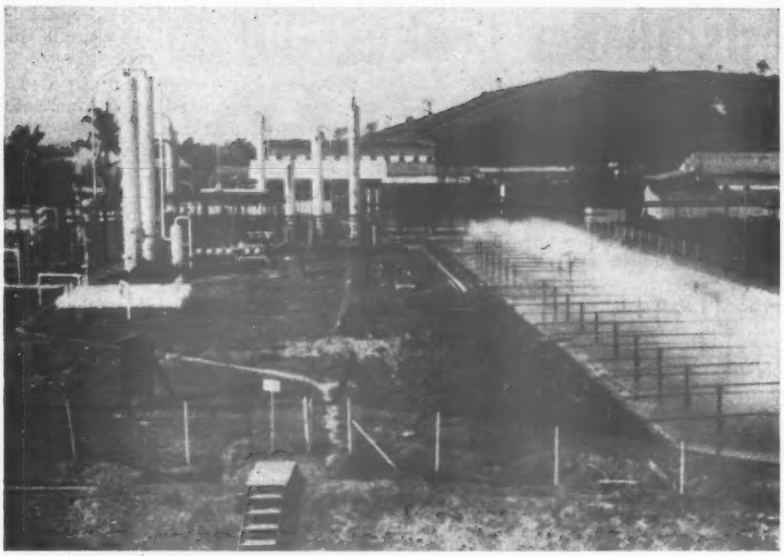
NEXT WEEK . .
Annual Number

This statistical issue will establish a new standard in the presentation of data which forecast drilling, refining and production trends and other guideposts to 1946 operations. These data have been largely reduced to easy-to-read charts, and will be grouped in a 32-page 4-color section. In addition the issue will contain the Journal's annual detailed analysis of new discoveries, extensions, and proven petroleum reserves by fields and states.

Emery Succeeds Parsons In Chemical Society Post

NEW YORK.—Alden Hayes Emery has been chosen secretary and business manager of American Chemical Society to succeed Dr. Charles L. Parsons, who retired December 31 after serving as secretary 38 years and as business manager 14. Emery had been assistant manager since 1936 and assistant secretary since 1943.

Emery received his B.A. degree magna cum laude in 1922 from Oberlin College, where he speciaized in chemistry. After obtaining a master's degree from Ohio State University in 1923, he joined the Bureau of Mines as a chemist at the Pittsburgh experiment station. In 1927 he went to Washington to take up administrative work in the bureau. He resigned in 1936 to become assistant manager of of A.C.S.



Gasoline absorption plant in the Poza Rica field

Desulfurization Project Planned For Poza Rica Field

by Curtis Vinson

MEXICO CITY.—A desulfurization plant for Mexico's Poza Rica field, rich in the production of hydrogen sulfide as well as oil, is being planned by engineers of Petroleos Mexicanos, Mexico's governmental oil administration.

At present the project is no further along than the initial planning stage. It has been under consideration for some time. But the ambitious refinery, pipe-line and other plant improvement program carried on during 1945, plus various restrictions on equipment imports imposed by the war, has contributed to delay in the project's progress.

As yet cost figures are speculative though official estimates reach $1,000,000 or more. Date for start of construction has not been fixed but the project is expected to get under way in 1946. Project blueprints are accumulating and plans have passed the nebulous stage.

It is estimated that around 50 tons of sulfur can be extracted daily from the existing volume of hydrogen sulfide (H_2S) produced by the field.

Poza Rica's gas production is approximately 60,000,000 cu. ft. daily. Engineers point out that this runs 3.2 to 3.4 per cent H_2S. While there has been use of the gas without purification for boiler fuel in the field, the production has not been fully exploited commercially. For one thing, the H_2S provokes corrosion in pipe lines.

Petroleos Mexicanos has not yet contracted for specific process of desulfurization.

In addition to the output of sulfur, a highly valuable product, through processing the H_2S, the project would make available an added volume of natural gas for industrial fuel for Mexico City and Central Mexico. Utilization of it in this area would, of course, require pipe-line carrier.

The demand for industrial gas is growing constantly in the nation's capital, as well as in northern Mexico's industrial centers. There has been talk as well, from time to time, of making natural gas available to the individual consumer, the householder, in the national capital. However, the great expense that would be involved in piping Mexico City, coupled with the earthquake hazard, lends small encouragement to the latter, at least for the time being.

The growing concentration of industries in the environs of Mexico City, however, industries that could well use cheap gas fuel, may make it feasible before many more years pass to pipe gas from the nearest producing areas to the federal district.

PAW Seeks Increased Heating-Oil Ceilings

WASHINGTON.—A request for increased price ceilings on kerosene and distillate heating oils was made to Office of Price Administration this week in letters from Petroleum Administrator Harold L. Ickes and Deputy Administrator Ralph K. Davies.

The changes asked are that the price of distillate and kerosene in District 2 be increased by ½ cent per gallon, that the price of distillate only be increased 0.3 cent per gallon in Districts 1 and 3, and that the recent increase of 0.2 cent allowed by OPA be applicable to all sales in District 3 instead of only to sales for shipment to District 1.

These changes were recommended at a meeting of PAW officials and former associates serving as government consultants called by Davies last week to consider the shortage of kerosene and fuel oils. The group made no recommendation regarding heavy-fuel-oil prices, feeling that no reasonable price increase would have a material effect on residual yields.

In spite of refinery strikes and shortage of tanker crews this group concluded that the difficulties are economic rather than physical since there is sufficient capacity to meet demands. Advisers pointed out that under present price ceilings refiners cannot afford to increase heating-oil yields at the expense of gasoline, and that when gasoline storage is full there will be lower total crude runs, thus further aggravating the heating-oil situation. Prompt price relief was asked for this reason and also because the government has been unable to purchase kerosene at Gulf ports for shipment to Europe since OPA raised the price on sales to District 1.

PAW is also conferring with the Navy and War Shipping Administration regarding suggestions for reducing their fuel-oil liftings during the next few weeks. Navy recently requested an increase above earlier first-quarter estimates totaling 70,000 bbl. per day of Navy special fuel oil, required for unscheduled redeployment of troops via Navy vessels. Navy has already contracted for an additional 28,000 bbl. per day on the West Coast and has agreed to reduce its liftings on the East and Gulf coasts and reduce its stocks below its previous estimates.

An emergency hinges on the routing of residual oil by barge and tank cars from New York to Boston because New York refineries have not been so hard hit by the delay of Gulf tankers. Added to this is the fact that 43 tankers are now tied up at Gulf ports because of absenteeism among crews.

Many companies are restricting customers to a 20 to 30-day supply.

THIS WEEK

LABOR—Increase of 18 per cent in basic refinery wages recommended by fact-finding panel. . . . ¶Several additional companies settle wage dispute at 18 per cent advance in private negotiations with union. . . . C.I.O. Oil Workers president, O. A. Knight, criticizes wage-panel recommendation. . . . ¶Navy turning plants back to private management as rapidly as wage difficulties are settled. . . .

PRICES—Middle West motor-fuel and natural-gasoline markets softening. . . . Continued high production of gasoline, reduced consumption, greater inventories are controlling factors. . . . Substandard products offered more freely. . . . Refiners offering full-specification materials are resisting pressure—successfully, so far. . . . ¶PAW advisory committee recommends further price advances for fuel oil. . . . OPA informed that capacity is adequate, but plant operators cannot afford to make cheaper products at expense of gasoline. . . .

REFINERIES—Surplus Property Administrator recommends disposal of wartime plant facilities to private operating companies. . . . Proposal closely follows industry-committee program presented O'Mahoney committee. . . . ¶Doubt prevails that government-owned alkylation and isomerization plants will prove economically attractive in peacetime. . . . Congress has until mid-February to take action, or SPA report becomes automatically operative. . . .

STRIPPERS—Interior Department's special stripper-well report transmitted to Economic Stabilizer Collet. . . . He must decide on continuance or cessation of payments. . . . ¶Strong group in industry seeking permanent price advantage for stripper production. . . . ¶RFC wants specific instructions, for protection. . . .

LEGAL—First court skirmish in reinstated "Mother Hubbard" antitrust suit scheduled February 18. . . . Department of Justice will ask that court set specific date, requiring oil associations and companies to make pleading. . . . ¶Northern Natural Gas Co. petitions for rehearing on Federal Power Commission order regulating end use of natural gas. . . . ¶Entire industry fearful of FPC's assumed authority. . . . See move as entering wedge harmful to all branches of industry—telling where, to whom, how much, and when gas may be sold. . . .

TRANSPORTATION—Texas independents to be given opportunity to bid on Big-Inch lines. . . . SPA proposal for disposing of lines draws criticism from coal and railroad interests. . . . ¶Trans-Arabian Pipe Line Co. granted concession for building line across Palestine. . . . Constitutes another step in planned outlet for Arabian production. . . . ¶Hearing on Metropolitan Eastern gas line from Carthage field, Texas, to Ohio reset for April 15. . . . ¶Gasoline shipments through pipe lines sag since end of war. . . . Retirement of WEP 20-in. products line chief cause. . . . Private lines increase deliveries. . . . ¶Stanolind now running 21,000 bbl. daily from Rangely field, gradually expanding crude-oil market. . . .

INVASION—Standard Oil Co. of California invading East Coast motor-fuel market. . . . Company establishing network of jobbers and dealer outlets. . . . Tankers will move products from West Coast via Panama. . . .

Acme

President Juan Antonio Rios of Chile (right) holds bottle of sample oil which was taken from the Spring Hill petroleum field, located about 6 miles from Puerto Progreso, Tierra del Fuego, Straits of Magellan. Sample of the oil which came to the surface December 29 was presented by Oscar Gajardo, vice president of the Corporation for the Promotion of Production, who is at the left. Shows reported at the test well afford ground for belief that Chile is about to open petroleum reserves which will more than meet the country's requirements. On drill-stem test from 7,410-28 ft. the well put 650 ft. of oil in the pipe in 9 minutes, indicating possible production of 300 bbl.

SPA Urges Retention in Oil Service of Big-Inch Lines

WASHINGTON.—The two big-inch government-owned pipe lines should be continued in petroleum service, if necessary under public operation, the Surplus Property Administration reported to Congress last week.

Every effort will be made to sell or lease the lines to private interests for common-carrier use, but if this fails the Government should operate them, SPA stated. However, it promised that government operation would not be undertaken without express approval of Congress.

The report is in sharp variance with studies made by petroleum-industry groups and private interests, both in its recommendations and in its calculations of the comparative cost of shipping oil through the lines and by coastwise tankers. SPA economists believe that the 24-in. crude-oil line enjoys a distinct cost advantage over tankers and that even the 20-in. products line could be made competitive. Nor does SPA consider that there would be much of a problem in obtaining supplies of crude or products to operate the lines at an efficient capacity. It is especially optimistic about the prospects of dividing the lines in the middle and using the segments to supply refineries and markets in the interior of eastern United States by pumping from both the Gulf and East coasts.

Conversion of the lines to natural gas is economically feasible, SPA declared, but it does not recommend such use.

The four small government-owned pipe lines present no special disposal problems, SPA says, since no one has raised any objections to whatever use may be made of them. These are the Ohio Emergency, Southwest Emergency, Florida Emergency, and the Plantation Extension lines, and the report says there is reasonable prospect of selling all of these to private industry for use in place rather than for salvage.

The report raises the question of the government policy in disposing of tankers, implying that the Government should not sell its tankers so cheaply as to put the big-inch lines out of business. It also implies that industry studies to the effect that the lines could not compete with tankers have been based on optimistic estimates of tanker purchase prices, and stresses the point that operation of the big-inch lines would put a ceiling on coastwise tanker rates to protect consumers from excessive charges.

SPA also discusses the antitrust suit pending against the American Petroleum Institute and 21 major oil companies, and reviews charges of monopolistic control of pipe lines by major companies and excess profits of pipe lines, leaving the implication, without actually saying so, that the big-inch lines ought not to be sold to major companies.

"If sold to private interests for use in the transportation of petroleum," the report states, "preference must be given to purchasers who, by the nature of their interest and connections, would be most likely to operate them as true common carriers, or else some such provision should be included in the terms of sale."

Statistics Support Contentions

A series of statistical appendices purport to prove that the big-inch lines could compete with tankers, particularly if converted from electric to diesel power. For instance, one of these estimates that the cost of feeding the 24-in. line could be reduced materially by construction of a large-diameter feeder line from West Texas to Longview, and that by this means West Texas crude could be delivered to New York refineries at a cost of 30 cents per barrel compared with 50 cents via tankers.

In summarizing its conclusions, the SPA report says:

"The big-inch and little big-inch offer distinct possibilities for postwar use:

"1. Continuance in Texas to East Coast service, for which they were originally designed.

"2. Segmentation, reversal, or conversion to other petroleum service.

"3. Conversion to the transportation of natural gas.

"From a purely economic standpoint, there is little or no reason that the big-inch should not continue in the service for which it was built in competition with other forms of transportation. It is strategically situated and enjoys a distinct cost advantage.

"The little big-inch is in a less strong position with tankers. Present cost estimates indicate that it is slightly higher than tankers at capacity, and materially higher if operated at two-thirds of capacity. Conversion to diesel power might make it competitive at capacity.

"Even if full costs of operation on either the big-inch or little big-inch were equal to, or somewhat in excess of, comparable tanker costs, the pipe lines would not necessarily be non-competitive. To the many petroleum shippers who do not own transportation facilities, prevailing rates, and not the operator's costs, constitute the cost of transportation. That rates do not correspond with costs is indicated by the high return on investment which many pipe-line companies enjoyed before the war, and by the wide seasonal and annual fluctuations in prewar tanker rates. As long as minimum charges on the pipe lines, based on full cost of operation plus a reasonable return on investment, approximated average or minimum rate levels by other means of transport, the pipe lines would be competitive. Their operation on such a basis would make low-cost, dependable transportation available to those who do not now have access to either pipe lines or tankers.

"Both the big inch and little big inch would be without equal for the transportation of petroleum to interior points where they would not come into competition with tankers. No overland facilities have comparable economy or efficiency, including industry-owned pipe lines.

"Conversion of the big inch and little big inch to gas is economically feasible and possible from an engineering standpoint. However, their disposal for this purpose can be considered only if the national security is otherwise adequately protected. Also, such use might entail serious disruption of eastern coal, railroad, and other industries.

"Prospects for disposal of the other government-owned pipe lines for some productive purpose are good.

Disposal Problems and Policy

"Government-owned pipe lines would be vital in the event of another emergency, according to the findings of the Army-Navy Petroleum

Index Ready Soon

The complete editorial index of The Oil and Gas Journal for 1945 is now is preparation, and will soon be ready. Due to the continued shortage of paper, it will not be published in a regular issue. The complete index, enlarged and improved and with more cross-references, bound separately, will be sent without charge to all subscribers requesting a copy. Address requests to Circulation Department, P. O. Box 1260, Tulsa.

Board. Because maintenance by the Government in an inoperative status would probably be unjustifiably expensive, the board recommends that they be disposed of to private industry with a recapture clause, unless such restriction would prevent their sale. The findings of the ANPB are assumed to apply principally if not exclusively to the big inch and little big inch, since the smaller projects would be capable of relatively quick reproduction in the event of another emergency.

"Careful consideration of all the factors involved leads to the conclusion that the big inch and little big inch should be kept in petroleum service. If they cannot be used for the transportation of petroleum from the Southwest to the eastern seaboard, they should be disposed of for service to interior points. Every effort will be made to dispose of them to the petroleum industry, including the many small or independent operators who in combination might acquire them. That failing, consideration will be given to the possibilities of lease. Government operation on a full-cost basis may have to be considered if all efforts at disposal should fail. Such a solution would be contingent upon the express approval of Congress. Conversion to gas will be considered only if no use can be found in petroleum service, and the national security is otherwise adequately protected.

"The smaller government-owned pipe lines present few if any disposal problems from a policy point of view. There is reasonable prospect of finding some economic use for each of them in the hands of private industry."

Tanker Competition

The impression that pipe lines cannot compete with tankers rests on a prewar concept based on small-diameter lines and on misapplication of statistics, the report says, insisting that the big inch can compete with any other form of transportation. SPA estimates that postwar direct operating costs in shipping crude from Texas to New York at capacity operation will be 6.9 cents per barrel, or 6.6 cents at two-thirds capacity, using an adjusted cost figure for electric power, whereas tanker direct costs will be 11 to 12 cents per barrel.

Taking other elements of cost, including taxes, depreciation, and return on investment, SPA estimates that big inch can operate at capacity at 17.1 cents per barrel from East Texas to New York compared with 32.6 cents for tankers, including 24.1 cents for tanker costs, 7.5 cents for pipe-line movement to Gulf ports, and 1 cent for transfer charges. At two-thirds capacity big inch would have an over-all charge of 21.8 cents per barrel, or still below tanker charges. The report also says that conversion to diesel power would permit the big inch to lower its costs by 1 cent per barrel.

Admitting that the line might not be able to compete with tankers in moving crude produced close to Gulf ports, SPA concludes that ample supplies to feed the big inch could be obtained from other Texas fields by construction of additional feeder lines with transportation costs no higher than piping the oil to tidewater.

Much the same conditions apply to the 20-in. products line in spite of the fact that it originates at refineries located at Gulf ports, SPA declares. The report says the little big inch will have a postwar direct cost of 9 cents per barrel on electric power and 8 cents on diesel, compared with tanker costs of 9.6 cents. With all charges included the line could deliver for 21.7 cents on electric power and 20.7 on diesel, compared with tanker charges of 20.2 cents per barrel.

By using the big inch lines to move both crude and products from the Gulf and Atlantic coasts into the interior, SPA says, great economies would result, since all other means of transportation would be considerably more costly, including the small-diameter private pipe lines now serving this area. The report suggests that new refineries might spring up along the line of the big inch, and that the little big inch could supply products to this area at considerable savings in cost.

Legion of Merit Award Goes to Five Oil Men

WASHINGTON. — Five oil men, members of the wartime staff of the fuels and lubricants division, Office of the Quartermaster General, have received the Legion of Merit for distinguished service in providing petroleum products for Allied land forces during the war. They are Lt. Col. Joseph M. Sills, Lt. Col. Benjamin F. Hake, Comdr. Clarence J. Livingstone, Maj. Herbert M. Fish, and Capt. Herbert E. Schnur. Major Fish and Captain Schnur are still on duty with the division. The others have returned to private industry. The awards were presented by Brig. Gen. H. L. Peckham, chief of the division.

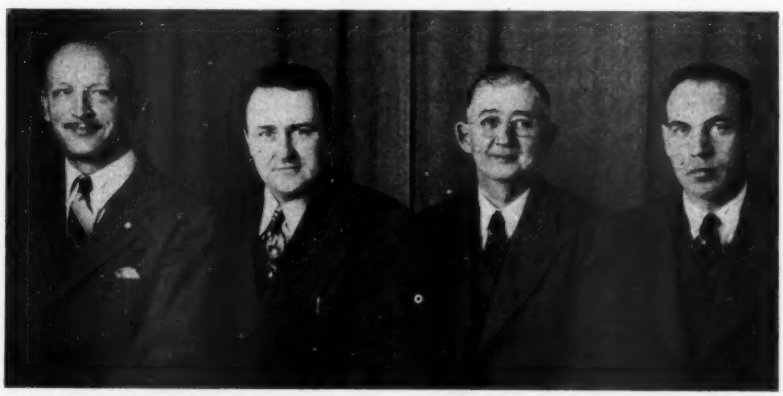
Ralph Gallagher Joins J. P. Morgan & Co.

NEW YORK.—Ralph W. Gallagher, recently resigned board chairman of the Standard Oil Co. (New Jersey) has been named a member of the board of directors of the J. P. Morgan & Co.

No further details could be obtained officially. However, it is known that Gallagher was offered several different positions upon his resignation from Jersey Standard and it's believed that his new work will involve reorganization procedures. Reorganization was one of Gallagher's strong points in his 49-year career in petroleum.

Statistical Data Now Concentrated

Statistical data on production, drilling, and refinery operations along with market summaries and the trend of petroleum stocks have been concentrated for the convenience of readers. These data appear on pages 116 and 117 in this issue and will appear regularly immediately preceding the Exploration and Drilling Section in subsequent Journals.



These men were elected officers of the Drumright (Okla.) chapter of the American Petroleum Institute for 1946 at a recent meeting. They are: John S. Mallory, Tide Water Associated Oil Co., chairman; Joe A. Huitt, Deep Rock Oil Co., first vice chairman; R. J. Brakey, Hughes Lumber Co., second vice chairman, and Charles D. Borland, Gulf Oil Corp., secretary-treasurer

Gasoline Prices Reduced In Weakening Market

Reduction this week by Standard Oil Co. of Indiana of 0.3 cent a gallon in its normal tank-wagon price for gasoline to both consumers and dealers follows a steadily declining tank-car market. The reduction, which applies on three grades of motor gasoline and on aviation gasolines, is effective in Michigan, Indiana, Illinois, Missouri, Kansas, Iowa, Nebraska, North and South Dakota, Minnesota, and Wisconsin.

"The change simply recognizes the trend toward lower gasoline prices in the states mentioned," said Indiana Standard in its announcement.

In the Group 3 (Oklahoma) area no change was made in tank-wagon prices, but refiners dropped their tank-car prices ⅛ cent to correspond with a similar cut by Standard of Indiana. The new tank-car price for regular-grade gasoline is 5½-5¾ cents and for the 78-80 grade 6¼-6½ cents. No reduction in Oklahoma service-station prices was in immediate prospect, it was stated, although refinery stocks of motor fuel were rising and the tank-car market was described as "sloppy."

The price of natural gasoline was cut ½ cent in Oklahoma, making it 4 cents for 26-70 and 4.8 cents for 18-55.

The foregoing prices supplant those given in the table on page 116.

The weakness in the gasoline market is attributed in great measure to failure of refiners to make a drastic cut in crude runs promptly upon the ending of the war. These runs are estimated to have been reduced by about 10 per cent. An opinion expressed by some refiners is that they should have been slashed 20 per cent. The shortage of fuel oil is named as a reason for the high levels of refinery operations.

Gasoline stocks are believed to have been built up more rapidly in the last few months than in any similar period in oil history. For the country as a whole, the gasoline stock increase has been at an average rate of more than 2,000,000 bbl. a week for nearly 3 months.

Los Angeles Nomads Elect Officers for New Year

LOS ANGELES.—Officers for the coming year were elected as follows by the Los Angeles chapter of Nomads: President, Wilbur F. Bettis, M. O. Johnston Oil Field Service Corp.; vice president, James V. Robinson, Miller Robinson Co.; secretary, Earle Daniels, Hydril Co.; assistant secretary, Byron Landis, Web Wilson Oil Tools; treasurer, William McGraw, Western Pipe & Steel Co.; assistant treasurer, Thomas G. Martin, Eastman Oil Well Surveys; sergeant-at-arms, Wallace A. Sawdon, editor of "Petroleo"; deputy sergeant-at-arms, Dan Duncan, Emsco Derrick & Equipment Co.; regents, Roland Smith, export representative, and Ted Sutter, Baker Oil Tools, Inc.

Bettis is a past president and one of the founders of the chapter. Smith and Sutter are also former presidents. Elmer Smith, retiring president, is planning to move next month, with his family, to Caracas, Venezuela, where he will continue his work as export representative for American oil-equipment manufacturers.

Heated Opposition Seen for Tidelands Oil Legislation

WASHINGTON.—Heated opposition is predicted for the bill surrendering any federal claim to oil-bearing tidelands within the 3-mile limit, when it is taken up by the judiciary committee of the Senate. The measure has been passed by the House.

Harold L. Ickes, secretary of the interior, has indicated he expects to appear personally to oppose the measure when the committee opens hearings February 5.

The president's continental shelf proclamation establishes United States jurisdiction from an international standpoint and does not involve the issue of ownership. However, it raises a question as to the extent of state boundaries of the coastal states.

The pending legislation surrenders to the states title to submerged and tidal lands "within their boundaries."

I.P.A.A. Executives Meet To Discuss Oil Problems

SHREVEPORT.—The executive committee of Independent Petroleum Association of America, meeting here January 15 and 16, discussed problems facing independent oil producers throughout the country and furthered plans for the midyear convention of the association to be held in Houston next April.

Russell B. Brown, general counsel for the association, reported on current legislation related to the oil industry. The fight to obtain a price for crude oil on a par with the average price of other raw materials was discussed, and the committee reviewed the cost study made by the national crude-oil advisory committee, which involved examination of cost records on more than 50 per cent of the nation's production. The advisory committee recommended a substantial increase in the price of crude and will submit its findings to Office of Price Administration. Ratification of the Anglo-American oil pact was urged by the executive committee.

Houston Chapter of Nomads Elects Officers for 1946

HOUSTON.—The Houston chapter of Nomads elected officers for 1946 as follows: Charles W. Thornhill, Thornhill-Craver Co., president; Charles E. Richards, Gray Tool Co., vice president; George E. Tyson, Jones & Laughlin Steel Co., secretary-treasurer; Jay L. Speece, Gardner-Denver Co., assistant secretary-treasurer; Herschel J. Wood, Lebanon Steel Foundry, sergeant-at-arms; C. B. McDonald, A-1 Bit & Tool Co., deputy sergeant-at-arms; C. E. Whitney, Baker Oil Tools, Inc., and Tom W. Nelson, Gulf Publishing Co., regents.

The fifth annual inauguration dinner dance was held at the Rice Hotel January 18.

Frazier and Gravis Holdings Acquired by Syndicate

HOUSTON.—The interests of Jack W. Frazier, independent operator of Houston, in the Dyersdale field, 10 miles north of this city, have been acquired by W. E. Bakke, of San Antonio, representing a syndicate. According to an unconfirmed report, consideration was around $500,000.

The transaction includes 21 oil wells, 5 gas wells, and approximately 500 acres of land. Monthly oil production is about 25,000 bbl.

Bakke was reported to have purchased also the interests of Frank Gravis, San Antonio operator, in the Dyersdale pool, including 25 oil wells and 700 acres of land. Reports name $800,000 as the consideration involved. Gravis bought his Dyersdale holdings about 1½ years ago from the H. C. Cockburn interests.

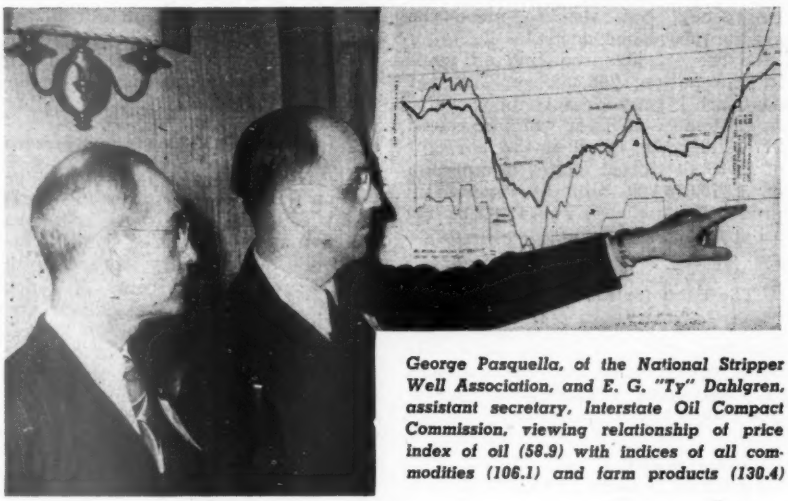
Water-Flood Operators Will Discuss Problems

Water flood operators of eastern Kansas and northeastern Oklahoma will hold an informal round-table engineering discussion at the Tioga Hotel in Chanute, Kans., January 24. The meeting, to start at 6:30 p.m., has been arranged by Marion Stekoll, water flood operator of Independence, Kans. It will be the first of a series of monthly meetings in which operational methods and comparison of data will be presented.

First discussion will be devoted to the matter of "bypassing, channeling, or breakthroughs." Everyone attending the meeting is urged to bring whatever material is available for presentation. In making the announcement, Stekoll emphasized that there would be no politics or policy matters, specific organizational setup, or dues. The meetings will be devoted exclusively to the technical aspects involved in water-flooding work.

72 Per Cent of U. S. Wells Are Strippers

. . . . And the Definition Is a Well on Which the Production Expenses Approximate Income . . .



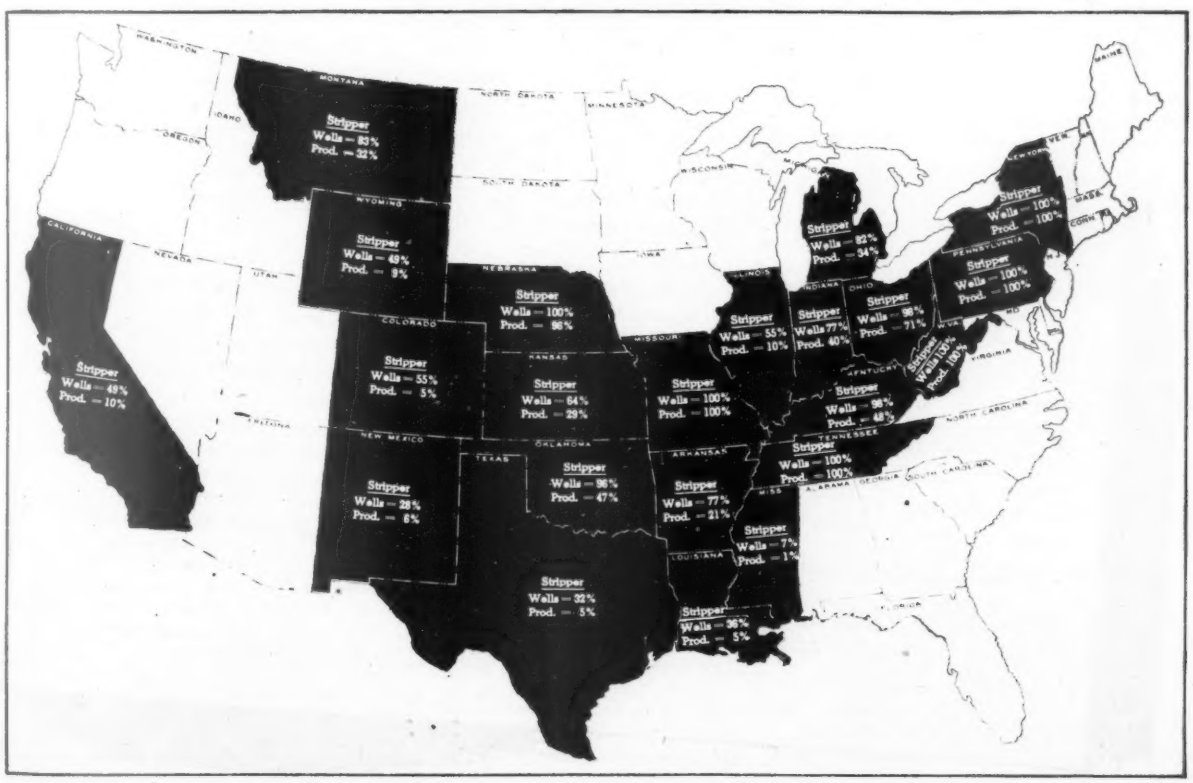
George Pasquella, of the National Stripper Well Association, and E. G. "Ty" Dahlgren, assistant secretary, Interstate Oil Compact Commission, viewing relationship of price index of oil (58.9) with indices of all commodities (106.1) and farm products (130.4)

E. G. Dahlgren and George Pasquella have recently completed a detailed 30-page report of the "stripper wells" of the country. Highlights of the report on this class of production, which long has been called the backbone of the oil industry, are given here.

THE patriotic motive of the stripper operators kept many a well in operation during the war years after its economic limit had been reached. This is true even with the federal compensatory payments to certain districts. With the scarcity of labor and materials presenting very difficult costs of producing oil, the operators production problems, and the rising costs of producing oil, the operators were in a very difficult squeeze.

Their plight was finally recognized by the federal Government when on August 1, 1944, compensatory payments were begun. In pools averaging less than 9 bbl. per well per day, this payment was 20 cents per barrel; less than 7 bbl., 25 cents; less than 5 bbl., 35 cents. A flat 75 cents per barrel was paid in Pennsylvania, New York, Ohio, and West Virginia for pools producing Pennsylvania grade crude; other grades of crude in these

Strippers make up the majority of producing wells in most states. For about half of the total list of oil-producing states, the majority of their present production is from stripper wells



states received the regular payments applicable to the rest of the country.

This additional income to the stripper operator provided the necessary funds for the reconditioning and cleaning out of his wells and the replacement of some of the worn-out equipment. This condition is reflected in the additional 14 million barrels of oil produced in 1944 over and above the 1942 figure. This oil was sorely needed for the succsesful prosecution of the war effort when flush and semiflush wells in all parts of the country were being produced at rates above their minimum efficient rate of production.

What Future for the Stripper?

Now it becomes a matter of greater importance than ever that the reserves underlying stripper wells be preserved, because many oil fields, damaged by their high rates of production have lost a substantial part of their reserves forever by pulling the wells too hard to meet the requirements of a nation at war. War proved that oil is ammunition, and every barrel possible should be conserved, not only for a possible future emergency, but also to meet the greater peacetime needs.

Of the 412,851 producing oil wells in the nation, 296,388, or 71.8 per cent, are classified as stripper wells. In 1944 these stripper wells produced 217,041,621 bbl. of oil or 12.9 per cent of a total United States production of 1,678,376,000 bbl. Average daily production per well was 11.1 bbl. for all oil wells, and 2.0 bbl. for the stripper wells.

The Facts for the Stripper Wells

The accompanying tabulation is interesting, not only from the standpoint of U.S. totals, but also as a basis of comparison to the 1942 survey. The number of stripper wells producing reached an all-time high, the 1944 figure being 3,107 greater than in 1942. It is particularly significant to note that the number of wells abandoned in 1944 was 1,141 less than in 1942. In 1942 there were 44 million barrels of recoverable oil left in the ground under strippers abandoned that year as compared to 34 million barrels of recoverable oil left under the 1944 abandonments.

Big Increases in Secondary Reserves

The right-hand columns in the tabulation offer some interesting data about estimated additional reserves which may be recovered from stripper wells by secondary methods with price increases of 25 cents, 50 cents, and 75 cents per barrel. There are, roughly, reserves of 3 billion barrels of oil in the U.S. that can only be recovered by secondary methods, and it is evident from this tabulation that a substantial price increase in oil will be necessary to recover the major part of these reserves.

In this survey, a stripper well is defined as one whose production expenses approximate income, so that under this definition a deep well with substantial production may be classified as a stripper well

FACTS AND FIGURES OF THE NATIONAL STRIPPER WELL SURVEY - FOR THE YEAR 1944

States	Number of Stripper Wells Producing.	Production, In Barrels Of Stripper Wells.	Aver. Price Of Stripper Well Production.	Productive Acres of Stripper Wells.	Productive Acres of All Wells.	Oil Well Abandonments in 1944.	Recoverable Oil Abandoned by Wells Plugged In 1944.	Estimated Additional Barrels Reserves Which May Be Recovered From Stripper Wells By Secondary Recovery Methods, With Price Increases Per Bbl. Of: 25¢	50¢	75¢
Arkansas	2,436	6,088,631	$0.95	26,498	60,610	52	90,000	None	50,000,000	100,000,000
California	10,500	29,400,000	0.98	87,000	244,000	200	1,000,000	None	200,000,000	300,000,000
Colorado	101	155,420	1.11	3,070	5,000	None	None	100,000	300,000	500,000
Illinois	15,050	7,367,000	1.30[a] 1.46[h]	106,000	329,050	668	668,000[i]	10,000,000	25,000,000	45,000,000
Indiana	1,449	2,039,000[e]	1.60[e]	8,065	13,545	45	66,000	None	1,000,000	1,500,000
Kansas	16,760	28,800,000	1.18	135,000	250,000	512	1,300,000	50,000,000	85,000,000	155,000,000
Kentucky	14,300	4,604,079	1.42	52,000	53,700	175	250,000	10,000,000	50,000,000	90,000,000
Louisiana	2,677	6,107,660	1.06[b]	208,750	322,800	266	931,000	1,100,000	40,000,000	85,000,000
Michigan	2,783	6,230,043	1.42[c]	31,205	49,125	199	100,000[j]	None	None	1,250,000[g]
Mississippi	31	167,590	0.93	1,120	18,440	27	100,000	400,000	500,000	575,000
Missouri	123	45,000	1.17[d]	710	710	None	None	None	100,000	200,000
Montana	1,860	2,731,098	1.19[a]	23,918	40,729	21	23,780	Trivial	1,757,475	3,514,950
Nebraska	72	440,000	1.10	1,380	1,380	18	175,000	None	None	None
New Mexico	1,102	2,464,385	1.04	42,040	162,960	1	1,460	5,000,000	10,000,000	20,000,000
New York	20,900	4,772,514	3.315	71,000	71,000	428	560,000	1,000,000	2,000,000	7,000,000
Ohio	22,483	2,103,593	1.96	823,372	843,372	594	850,000	2,000,000	6,000,000	15,000,000
Oklahoma	49,398	58,200,000	1.16	690,000	831,000	1,200	3,000,000	60,000,000[e]	100,000,000	185,000,000
Pennsylvania	83,000	14,118,000	3.237	505,000	505,000	2,450	1,000,000	50,000,000	100,000,000	150,000,000
Tennessee	15	9,500	1.47	105	105	14	10,000	None	75,000	100,000
Texas	32,170	35,226,150	1.18	289,530	2,750,000	2,376	23,000,000	125,000,000	250,000,000	375,000,000
West Virginia	17,300	3,115,783	2.59[f]	138,400	138,400	145	1,160,000	20,000,000[k]	50,000,000[k]	100,000,000[k]
Wyoming	1,878	2,856,175	0.95	27,475	76,157	9	12,500	2,431,550	7,996,100	17,176,000
Totals United States	296,388	217,041,621		3,271,638	6,767,083	9,400	34,297,740	337,031,550	979,728,575	1,651,815,950

e Unofficial estimate.
a Subsidy payments not included.
b Does not include subsidy premium payment.
c Average price for all oil including subsidy - unable to get an average price for stripper wells alone.
d 82¢ plus subsidy of 35¢.
e With an increase of $1.00 in the price, 10,000,000 bbl. would be recovered.
f $2.59 since Aug. 1, 75¢ subsidy.
g Secondary recovery has not as yet proved economical in Michigan. If price is raised 75¢ per bbl. additional wells would be drilled to increase estimated reserves as shown.
h Includes subsidy.
i Disregarding economics.
j Unknown, as a guess.
k Secondary reserves are 100,000,000 bbl. Figures shown are additions for price increases, over that of subsidy.

INTERNATIONAL

Special Mud Used in Venezuela's Deepest Well

A special drilling emulsion was developed for drilling Caribbean Petroleum Co. R-801, deepest test drilled to date in Venezuela, which is bottomed at 13,034 ft. D. B. Williams of the Caribbean company supplied the following exclusive statement on development and composition of the drilling mud to the Journal's editorial representative in Caracas:

"During the early part of 1944, R. A. Henkes, a petroleum chemist of the Caribbean Petroleum Co., patented in Venezuela a drilling emulsion in the name of the Shell Development Co.

"The invention deals with a new type of rotary drilling fluid, consisting of an emulsion of oil in clay mud. The clay mud may be any suspension of clay materials in water, such as ordinarily used for drilling wells. The emulsifier is a mixture of alkalies or surface active agents, to which may be added some of the chemicals commonly used in the treatment of drilling muds for the control of viscosity and gel strength.

"The new drilling fluid combines certain properties of the two principal classes of drilling muds presently used, namely, clay muds and oil-base muds. Its principal advantages are:

"1. The forming of a very thin wall by reason of the slight infiltration of the fluid in the formation. In this respect the fluid can be compared to oil-base muds and is more effective than the clay muds commonly used. It has the advantage that it reduces the danger that drill pipe may stick in the well, and the advantage also that on taking samples of the formation in the drilling process, these samples are not contaminated with infiltrated water.

"2. It possesses very good lubricating properties, which compare favorably with the properties of oil-base muds and are far better than those of the average clay mud. This property serves to reduce greatly the chance of sticking the drill pipe and to increase the life of drilling bits.

"3. The temperature coefficient of viscosity approaches that of clay mud and is far better than that of oil-base mud. This property is of importance in keeping deep holes clean, where bottom-hole temperatures are high.

"4. The use of the fluid permits very much higher drilling speeds in certain formations than with clay mud.

"5. The fluid is electrically conductive, which ensures better electric logs than those obtained with oil-base muds.

"This drilling emulsion has been used by the Shell in Venezuela for nearly 2 years with very successful results."

German Refining Industry To Be Freed of Controls

NEW YORK.—Sometime within the next 3 months the German petroleum industry will be back operating on a competitive basis without benefit of any governmental direction, other than rationing, according to a well-informed source who declines to be identified.

Moreover, by the end of January—in accordance with the Potsdam agreement—excess refineries in Germany will have been declared available for reparations. Under the Potsdam agreement, Russia is scheduled to get 25 per cent of all reparations in the American, British, and French areas. Ten per cent of this is to be given to Russia outright with the remaining 15 per cent to be paid for under some other arrangements, presumably imports.

While the Potsdam agreement provides that all capital equipment avialable for operation be declared by February 1, the disposition of such equipment may be strung out over a 2-year period subsequent to the February 1, 1946, date.

During the war, German refineries operated on a strictly cartel arrangement with the distribution of gasoline and other petroleum products under direct government supervision, "an arrangement that was much more severe than anything our Petroleum Administration for War ever dreamed of," according to one source. The money collected was split up among the various companies in accordance with the cartel arrangements. No brand names were evident in Nazi-land during the war years. However, this method of operation has been abolished under Allied rule. Moreover, all semblance of petroleum cartels have been completely abolished, it was pointed out.

During 1946 it is expected that the Russians in Germany will produce 600,000 tons of petroleum products from synthetic methods. The British are expected to refine a like amount and it is estimated that 800,000 tons will have to be imported, with the United States "probably" footing the bill for the latter.

Considerable discussion has been given by the joint Allied petroleum staff in Germany as to whether any German should be allowed to associate himself with synthetic methods of refining petroleum, with the final decision being left with the Russians who promised, in substance, that "we'll preclude any such possibility." It was feared that if Germans were allowed to associate themselves with the synthetic methods it might tend to strengthen any latent thoughts about "fueling another world war."

Actually the refineries in Germany suffered little from the ravages of war, the Journal was told, for while the damage often looked great, it was generally found to be the contrary on close examination. However, in most cases, underground pipe lines were bomb casualties, but this type of destruction was quickly repaired, it was pointed out.

All during the war, the Nazi refining capacity was approximately four times as much as needed to refine indigenous crude.

While Germany is expected to consume only 2,000,000 tons of petroleum and its products during the current year — under a continued rationing system—she accumulated, in comparison, 7,712,074 tons in 1938. Of this total, 4,960,000 tons was imported. Indigenous production accounted for only 552,074 tons, and 1,250,000 tons was produced synthetically during that year.

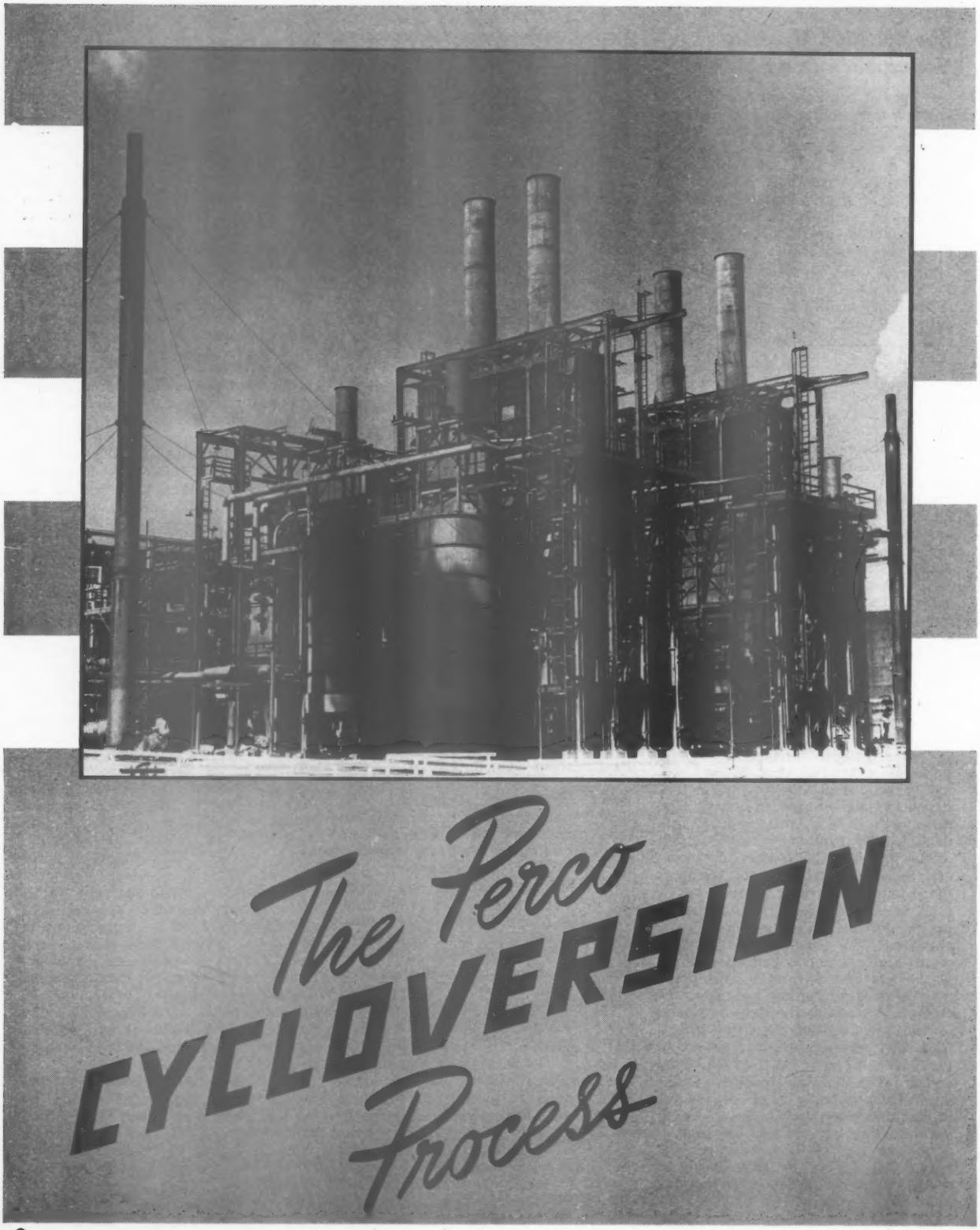
Rebuilt German Oil Plant Now Serving Russians

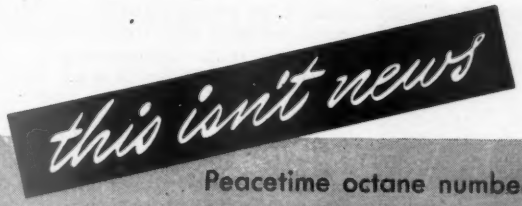
BERLIN.—The big Leuna synthetic-oil plant at Merseburg, wrecked by Allied bombs, has been restored to 20 per cent of its former gasoline output and now is supplying 200 tons daily to the Russian occupation authorities. During the war the plant was a special target for American Flying Fortresses, and between May 1944 and March 1945 it was bombed 22 times. It was bombed to complete uselessness in October 1944, according to its German manager of production.

The bombers continued their raids, however, and what they accomplished is visible amid acres of pipes, valves and vats, which form one of the world's most complete industrial establishments. Forty per cent of Leuna was totally destroyed and about 70 per cent of it unroofed. A German expert estimated that it will take at least 5 years to restore it to its former condition.

Leuna is a limited liability corporation whose stock was owned by the I. G. Farben industry. Since Allied confiscation of all Farben's German assets, the title to Leuna rests with the Allied control council for Germany.

Leuna is employing 18,000 workers, or about half peak wartime payroll.


The Perco
CYCLOVERSION
Process



Peacetime octane numbers of regular and premium grade motor fuels are expected to rise sharply as a result of wartime refining developments.

Cycloversion gasoline of superior quality is being produced at costs which compare favorably with thermal cracking.

Cycloversion utilizes an inexpensive rugged catalyst, a fixed bed method of operation and long process cycles. These factors result in premium gasolines at low utility and labor costs.

Cycloversion, because of its simplicity in process and design, requires only moderate investment. Small and medium size as well as large capacity units are assured of early investment return. Cycloversion may be the answer to your peacetime refining problems. Perco engineers will gladly review the economic application of Cycloversion to your operations.

PROCESSES ★ ENGINEERING

PERCO

RESEARCH ★ CONSTRUCTION

A Division of

PHILLIPS PETROLEUM COMPANY, Bartlesville, Oklahoma

Ludwig Caminita, Jr., and Gordon M. Sessions

PAW Team Sticks Together

WASHINGTON. — Gordon M. Sessions and Ludwig Caminita, Jr., the two top public-relations men of Petroleum Administration for War, have left government service to establish a Washington public-relations agency.

The new firm will offer to oil companies and other private interests a general service including public-relations consultation, writing, special reports and articles, radio scripts, and similar activities.

The two men are known in the oil industry through the results of their work in the generally high public esteem for PAW as compared with certain other government agencies.

Gordon Sessions joined the public relations staff at the old office of Petroleum Coordinator in August 1941, shortly after it was created, and was soon made director of that division. Previously he had had 20 years of newspaper and public-relations experience, chiefly in Chicago, where, among other positions, he was night city editor of the Associated Press and columnist on the Herald-Examiner.

"Curley" Caminita transferred to PAW in January 1942 from the public relations staff of the Fish and Wildlife Service of the Interior Department. Prior to his government service he had been in public-relations work in Washington and served as assistant to the president of George Washington University. Caminita served as assistant director of the public-relations division under Sessions, becoming director about a year ago when Sessions was made assistant to the president of Petroleum Reserves Corp.

Policies established by Sessions are generally credited with a large portion of the successful operation of PAW, particularly during the early days of the war when this agency and the oil industry in general were under considerable fire from Congress as a result of gasoline and fuel-oil shortages. The war problems of the oil industry were not well understood by other government agencies nor by the public, and a long program of education was required to bring about an appreciation of the true situation regarding oil shortages.

Between the fire-breathing pugnacity of Petroleum Administrator Harold L. Ickes and the cautious reticence of Deputy Administrator Ralph K. Davies, Sessions was constantly walking a tight rope in his efforts to get the facts published without disclosing military information or antagonizing other government or industry officials. Sessions mapped out the elaborate public-relations campaigns telling the story of building the big-inch pipe lines and the importance of early completion of the 100-octane-aviation-gasoline plants, and had much to do with framing the public speeches of Ickes and Davies and their statements before the many congressional committees which "investigated" the oil situation during the war.

While their activities may have appeared to consist chiefly of writing press releases and answering inquiries from news correspondents, both Sessions and Caminita took part in all PAW staff conferences and meetings of Petroleum Industry War Council, and were constantly advising PAW officials on the probable public reaction to their policies and statements. Since PAW was so intimately tied up with the oil industry, the policies set by this pair not only brought general commendation to the accomplishments of this government agency but also improved the public relations of the entire oil industry.

The firm of Sessions and Caminita has established a temporary office at 1801 Calvert Street, N.W., pending acquisition of a suite in a downtown office building. At present the two partners are giving a major portion of their time in assisting PAW officials and a special staff in writing a history of PAW and the oil industry's part in the war, a project being financed by a special appropriation from PIWC.

Overseas Oil Equipment Declared Surplus

WASHINGTON. — Many fixed installations and much equipment of direct interest to the oil industry are being declared surplus by commanders in various overseas military theaters, according to Thomas B. McCabe, foreign liquidation commissioner. All are to be sold where located.

Among fixed installations to be disposed of are pipe lines, marine depots, bulk stations, and airport servicing installations, usually complete with movable refueling equipment. Much of the property is in Europe, the Near East, and in many Pacific islands. There are substantial quantities also in Canada, in the China-Burma-India theater, in central Africa and elsewhere.

Sale of Republic Petroleum Holdings Under Discussion

LOS ANGELES. — Negotiations looking to sale of several California properties of Republic Petroleum Co. to a major oil company for around $1,000,000 are reported to be under way.

C. C. Spicer, president of Republic, said the company's holdings in some 14,000 acres of New Mexico properties, main source of its current income, are in no way involved in the reported negotiations. Also, he said, any sale contemplated would not include most of the company's undeveloped California holdings or interests in Hamilton Dome, Wyo., or Colorado leases. Identity of the major company figuring in the reports was not disclosed.

California Standard East Coast Marketer

NEW YORK. — Confirming rumors that Standard Oil Co. of California was planning to market gasoline, under its own brand name, on the East Coast, the press, last week, was invited to attend an informal meeting with the president and directors of California Standard's new subsidiary, California Oil Co.

Two grades of gasoline, regular and premium with octane ratings of approximately 78 and 84, respectively, will be sold under the "Calso" brand. While the plan is to establish this brand on the East Coast, gasoline will be sold to jobbers who prefer to market it under their own brand. As many tankers as necessary will be used in the West Coast-East Coast run to supply demand, it was said. At present, the Tuttle and a sister ship, each of 150,000 bbl. capacity, are in the service.

While nothing was said officially regarding the new company's plans to market heating oils here, indications are that this may materialize when demands are made.

Officers and directors of the new company are: E. W. Endter, president; E. H. Todd, C. J. Moody, H. C. Teasdel and J. T. Deane, vice presidents; and H. H. Brereton, secretary.

Continental Oil Sells Florence Field Wells

The Continental Oil Co. has sold its 30 wells in the Florence field of Fremont County, Colorado, to Earl Hollandsworth, independent operator of Longview, Tex., according to an announcement by W. H. Ferguson, vice president of Continental with headquarters in Denver. The consideration was not announced. Hollandsworth had previously purchased 9 wells in the south extension of the Florence field.

The Florence field is the second oldest producing area in the United States and the oldest west of the Mississippi River, its first well having been completed in 1862. The Continental company will continue to run the oil for its Denver refinery.

New Company Organized To Develop Gilsonite Fields

DENVER. — Standard Oil Co. of California and Barber Asphalt Corp. have organized American Gilsonite Co. to develop what is described as the world's only known important source of gilsonite, a little-known hydrocarbon capable of many uses. The gilsonite fields in eastern Utah and western Colorado were owned formerly by Barber Asphalt, with headquarters in New York. The new concern will be headed by Clarence F. Hansen, formerly chief engineer in Standard's manufacturing department in California.

Gilsonite is a hard, shiny-black substance closely related to petroleum, engineers say. Because of its resistance to acid it is used in the manufacture of storage-battery cases, and its high melting point is important in making foundry forms. It is also used in paints, varnishes, and inks, and may later be developed as a binder for plastics. It is considered important too as a possible source of synthetic crude oil.

Gilsonite, named for a Salt Lake City man who first put it to commercial use many years ago, is found in virtually a pure state in vertical fractures of the earth's surface.

Five Companies Active in North Carolina Leasing

ELIZABETH CITY, N. C.—Five oil companies have leased 256 tracts of land in Pasquotank County, totaling 64,019 of the county's 152,720 acres. Landowners are receiving 10 cents per acre for oil rights, and the county register of deeds an average of $4 per document for the registration. This figure applies to Pasquotank only. Hundreds of thousands of acres have been leased in adjacent counties.

Leading in the field in the Albemarle region is Standard Oil Co. of New Jersey, which has leased 148 tracts averaging 23,409 acres. Gulf Refining Co., though it has entered only four leases for registration, has a total of 22,116 acres, mostly in the Newland section. A newcomer is Smith Petroleum Co. of Grand Rapids, Mich., which has been quietly leasing in the Weeksville section. It has 83 separate documents registered for a total of 12,827 acres. Sun Oil Co. has four tracts, totaling 435 acres.

Schoeneck New Chairman of Mt. Pleasant A.P.I. Group

MT. PLEASANT, Mich. — William E. Schoeneck, of The Ohio Oil Co., Grand Rapids, was elected chairman of the Mt. Pleasant chapter, American Petroleum Institute, for the coming year. William M. Schulz, Cities Service Oil Co., Mt. Pleasant, is first vice chairman; O. E. McAlester, Sun Oil Co., Mt. Pleasant, second vice chairman.

DEATHS

Rupert J. Daugherty, 55, superintendent of the public relations department of Cities Service Oil Co., died January 12 in Bartlesville, Okla. Daugherty, with Cities Service since 1926, was active in civic affairs. He was a member of Bartlesville's board of city commissioners 16 years, for 12 years as mayor. He was a past president of the Bartlesville Chamber of Commerce and national counsellor to the Chamber of Commerce of the United States. During the war he was a member of Oklahoma State Council of Defense and consultant to the U. S. Treasury Department.

Sim Jenkins, 75, independent oil operator, died January 13 in Athens, Tex.

Lloyd P. Lochridge, 57, manager of domestic lubricating oil sales for Sinclair Refining Co. since 1924, died January 10 in Forest Hills, N. Y. Lochridge joined Sinclair in 1919 as manager of the Texas division. During World War 2 most of his time was spent in Washington, as Sinclair's special representative. He was a graduate of University of Texas and entered the oil business as branch manager for Pierce Oil Co. in Houston. Before that he had been editor and publisher of the Austin (Tex.) Statesman.

James Young, Jr., 42, vice president of Lockhart Oil Co. and Reynosa Pipe Line Co., died January 11 in Corpus Christi. He was chairman of the executive committee of the Better Government League which directed the recent successful movement to oust that city's municipal administration.

George B. Parkinson, one of the original lessors in the Iles field in Colorado and active in oil in the Rocky Mountain area and in Arkansas, died in San Marino, Calif., January 7. His last work was in connection with the completion of the Iles field unit agreement last November.

Guy A. Davis, 42, manager of Highland Oil Co., died of a heart attack December 31 in San Antonio.

John Brooks, retired oil driller, died at Sarnia, Ont. Born in Enniskillen, Brooks took up the drilling trade in 1918, working in the Celebes, Sumatra, Borneo, Dutch East Indies, South America and other foreign fields.

Ernest A. Bucklin, 69, veteran oil-well driller and contractor, died in Oklahoma City.

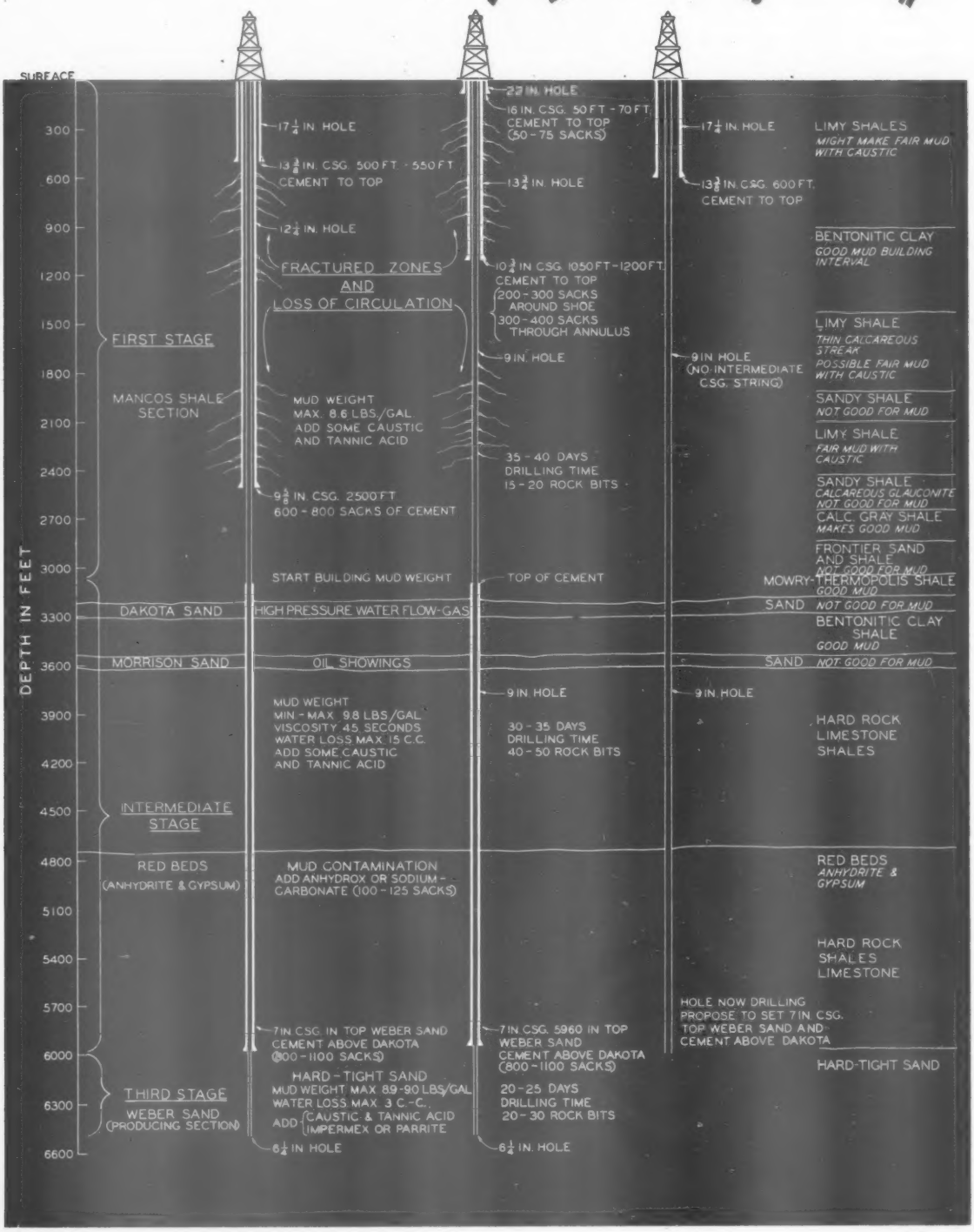
George Tuttle, 88, oil producer, died January 8 in Red Rock, Pa. He began working in the Bradford oil fields more than 50 years ago, later becoming a successful independent operator.

Arthur P. McGrath, 47, sales promotion and advertising manager for Mid-Continent Petroleum Corp., died January 10 in Tulsa. He was a graduate of De Paul University and a veteral of World War 1.

Thomas E. Mayberry, 56, oil operator, died at Crockett, Tex.

DRILLING IN Rangely

Prevention of circulation losses in fractured shale zones is a major drilling problem at Rangely. Development of methods to seal crevices, and formulation of adequate casing and mud programs are involved.

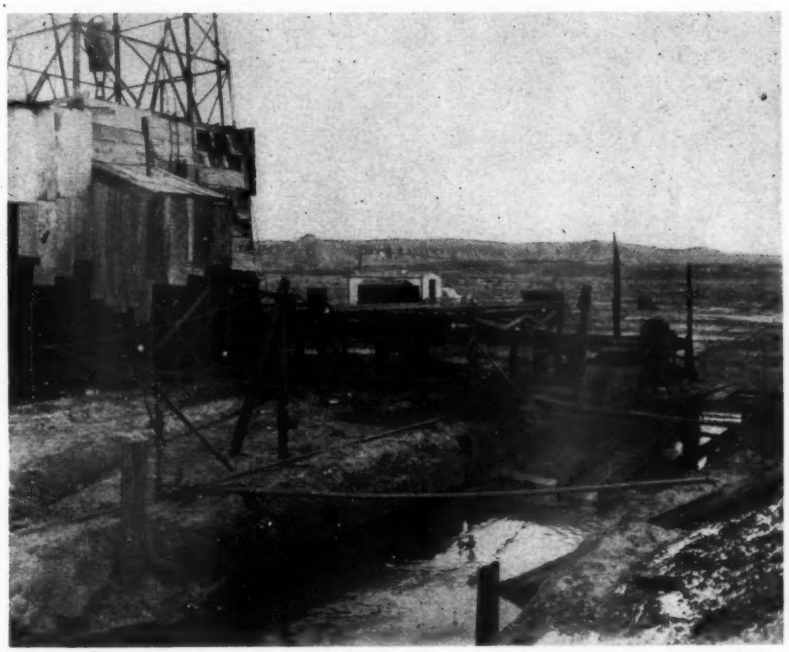

SURFACE
DEPTH IN FEET
300
600
900
1200
1500
1800
2100
2400
2700
3000
3300
3600
3900
4200
4500
4800
5100
5400
5700
6000
6300
6600
FIRST STAGE
MANCOS SHALE SECTION
DAKOTA SAND
MORRISON SAND
INTERMEDIATE STAGE
RED BEDS (ANHYDRITE & GYPSUM)
THIRD STAGE
WEBER SAND (PRODUCING SECTION)
17¼ IN. HOLE
13⅜ IN. CSG. 500 FT. - 550 FT. CEMENT TO TOP
12¼ IN. HOLE
FRACTURED ZONES AND LOSS OF CIRCULATION
MUD WEIGHT MAX. 8.6 LBS./GAL. ADD SOME CAUSTIC AND TANNIC ACID
9⅝ IN. CSG. 2500 FT 600 - 800 SACKS OF CEMENT
START BUILDING MUD WEIGHT
HIGH PRESSURE WATER FLOW-GAS
OIL SHOWINGS
MUD WEIGHT MIN - MAX. 9.8 LBS/GAL VISCOSITY 45 SECONDS WATER LOSS MAX. 15 C.C. ADD SOME CAUSTIC AND TANNIC ACID
MUD CONTAMINATION ADD ANHYDROX OR SODIUM - CARBONATE (100 - 125 SACKS)
7 IN. CSG. IN TOP WEBER SAND CEMENT ABOVE DAKOTA (900 - 1100 SACKS)
HARD - TIGHT SAND MUD WEIGHT MAX 8.9 - 9.0 LBS/GAL WATER LOSS MAX. 3 C.-C., ADD CAUSTIC & TANNIC ACID IMPERMEX OR PARRITE
6¼ IN. HOLE
22 IN. HOLE
16 IN. CSG. 50 FT - 70 FT. CEMENT TO TOP (50 - 75 SACKS)
13¾ IN. HOLE
10¾ IN. CSG. 1050 FT - 1200 FT. CEMENT TO TOP 200 - 300 SACKS AROUND SHOE 300 - 400 SACKS THROUGH ANNULUS
9 IN. HOLE
35 - 40 DAYS DRILLING TIME 15 - 20 ROCK BITS
TOP OF CEMENT
9 IN. HOLE
30 - 35 DAYS DRILLING TIME 40 - 50 ROCK BITS
7 IN. CSG. 5960 IN TOP WEBER SAND CEMENT ABOVE DAKOTA (800 - 1100 SACKS)
20 - 25 DAYS DRILLING TIME 20 - 30 ROCK BITS
6¼ IN. HOLE
17¼ IN. HOLE
13⅜ IN. CSG. 600 FT. CEMENT TO TOP
9 IN HOLE (NO INTERMEDIATE CSG. STRING)
9 IN. HOLE
HOLE NOW DRILLING PROPOSE TO SET 7 IN. CSG. TOP WEBER SAND AND CEMENT ABOVE DAKOTA
LIMY SHALES MIGHT MAKE FAIR MUD WITH CAUSTIC
BENTONITIC CLAY GOOD MUD BUILDING INTERVAL
LIMY SHALE THIN CALCAREOUS STREAK POSSIBLE FAIR MUD WITH CAUSTIC
SANDY SHALE NOT GOOD FOR MUD
LIMY SHALE FAIR MUD WITH CAUSTIC
SANDY SHALE CALCAREOUS GLAUCONITE NOT GOOD FOR MUD
CALC. GRAY SHALE MAKES GOOD MUD
FRONTIER SAND AND SHALE NOT GOOD FOR MUD
MOWRY-THERMOPOLIS SHALE GOOD MUD
SAND NOT GOOD FOR MUD
BENTONITIC CLAY SHALE GOOD MUD
SAND NOT GOOD FOR MUD
HARD ROCK LIMESTONE SHALES
RED BEDS ANHYDRITE & GYPSUM
HARD ROCK SHALES LIMESTONE
HARD-TIGHT SAND

Operations Group Themselves Into Three Stages, Representing Formational Divisions

by Neil Williams

OPERATIONS pertaining to the drilling and completion of wells in the Rangely field of northwestern Colorado more or less automatically group themselves into three stages, representing the different main formational divisions of the well bore. The first comprises the drilling of the Mancos shale section extending from the surface to a depth of approximately 3,000 ft. The second takes in the intermediate series of formation from the base of the Mancos shales to the producing horizon, the Weber sandstone, topped at depths of 5,600 to 6,000 ft. over the apex of the structure. The third concerns the producing formation, involving approximately 600 ft. of hole, embracing the drilling of this section and the final completion of the well.

Each stage or division contributes various individual problems to the over-all drilling and completion of the well. In so far as the first two are concerned, some of their problems are overlapping and cumulative since what is done to meet the individual conditions in one may complicate or create additional drilling problems in the other. In their case the adoption of an over-all drilling program dictated by opposing factors must be considered. On the other hand, since the oil string of casing is run and cemented through the above two upper main divisions of the hole before drilling the producing formation is undertaken, the conditions and individual problems encountered in the latter stage of operation can be met entirely independently of those in the rest of the hole.



Typical mud system layout in Rangely. Use of shale shakers is essential

The Drilling Program

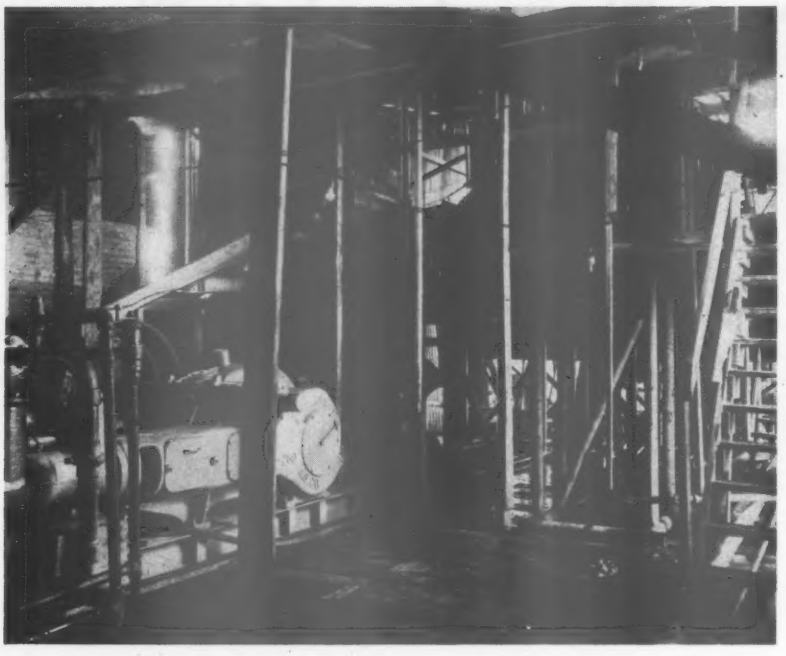
Generalized drilling program in the Rangely field showing the three main formational divisions and conditions of each as they relate to the different stages of operation. Indicated are three typical hole and casing plans being followed.

The Mancos shales in themselves are not difficult to drill so far as actual making of hole and use of bits are concerned. However, this section over a large area of the field, contains badly fractured zones and crevices, in which loss of mud circulation is the major problem. Delays in drilling because of the necessity of sealing these fractures to regain circulation greatly reduce the effective time through the section and thus add materially to the over-all time and consequent costs of wells. In view of the hard lower formations in which drilling naturally is slow and consumptive of bits, the thick, soft shale section ordinarily would be the part of the hole in which advantage would be taken to make time count. However, although it constitutes less than half the total footage of the hole, its drilling frequently requires much more time than all the rest of the hole.

Complicating efforts of operators to meet the problem, fractured zones may occur anywhere through the section, and thus where they are to be found cannot be known until they are drilled into. Also, there is no assurance that after one zone is sealed additional zones will not be encountered. Further, it is possible in some instances that fractures will not be opened until some time after the zone is drilled and building up of mud weight increases the differential pressure in the zone. Thus, when loss of circulation occurs it may not be known whether the location of the trouble is at the bottom or some place up the hole.

Loss of circulation in these fractured zones usually is both sudden and complete. Since commercial muds generally are used in drilling this part of the hole, the physical value of the mud lost in itself is a sizable item of expense. Due partly to this, total mud costs at Rangely are relatively high, and at best run from $12,000 to $15,000 per well.

In view of the losses incurred several operators are giving consideration to the potentialities of using natural muds made by the shales during drilling. There are several zones of fairly good bentonitic clay shales which might be taken advantage of, but as a whole the section does make good mud. Much of it consists of interspersed limy and calcareous or sandy formations which either could



Interior of drilling-rig housing showing mud pump (left) on ground level with drilling engines above

not be used at all or would require considerable chemical treatment and special conditioning. All factors considered, the use of purchased clays and muds, however, has proved most practical.

Mud Treatment

Mud conditioning for drilling this section in itself is comparatively simple. The main requirement is to hold the weight as low as possible to minimize the differential pressure exerted in the hole and thus lessen the chance opening fractures in zones which otherwise might be drilled without trouble. Most operators attempt to limit the mud weight to 8.6 lb. per gallon. The chief difficulty in this is that some of the shales drilled tend to build up the weight and the use of excessive volumes of water to offset this is to be avoided because of the danger of washing out of the shale walls. Although some operators use caustic and tannic acid, the free use of chemicals through this section is discouraged as it interferes with treatment of the mud for certain conditions in the lower part of the hole as will be discussed later.

When loss of circulation occurs, the first procedure usually is to load the mud system with bulky fibrous or cellulose material and continue pumping. In some instances, particularly if the loss of mud is only partial, this will prove effective in sealing the breaks, although there is the hazard that the correction will be only temporary. If circulation is not regained after pumping a reasonable length of time, cementing is resorted to. In this, the first step is to check the fluid level in the hole to determine the extent of mud loss and the quantity of cement that may be required. Cement is pumped through open-ended drill pipe which usually is run to the bottom of the surface casing shoe. If it is definitely known that the trouble is at the bottom of the hole and there is considerable open hole, the pipe may be run to a point just above where the fractures are known to exist, but this ordinarily cannot be determined.

Bulky material is pumped with the cement to facilitate clogging the crevices. Enough cement which normally would be required to fill up the hole to the bottom of the casing shoe, if the open-ended drill pipe is run to that point, is pumped. If the top of the cement comes up to that point, pump pressure is applied and held to force the cement into the crevices. If it does not, the operation is repeated. It may be necessary to repeat several times to insure that all fractures are closed. Frequently, as much as 400 sacks are required on a single job. With time allowed for cement to set, the hole then is redrilled through the cement.

The prevailing contract price for drilling in the field is $11 per foot. However, in view of the delays incurred by loss of circulation and correction work, contractors are protected by provisions in contracts for payment for nondrilling time after 72 hours by the operators on the basis of $650 per day.

While drilling the shale section, special precautions also have to be taken to maintain straight hole. This trouble is not encountered to any extent in any part of the hole, and is probably attributable to the fractured conditions which may tend to deflect the bit. Close control over weight on bits and rotary is required. Deviation surveys are made every 50 ft.

Closely affected by the loss of circulation problem is the formulation of an adequate and economical casing program. So far no uniform program has been established. Factors governing the formulation of a suitable casing problem involve the advantage of having an intermediate casing string through the shale section to shut off the lost-circulation zones while drilling the remainder of the hole. Opposed to this advantage is desire, based on the need for economies as they affect the present high well costs, to reduce the amount of intermediate pipe, and possibly eliminate it entirely.

Casing Programs

Until recently the general practice has been to make as much hole as possible through lost-circulation zones before running the intermediate protection string. One major company continues to follow this practice with a program calling for approximately 2,500 ft. of 9⅝-in. casing set in 12¼-in. hole. In this program, approximately 500 ft. of 13⅜-in. casing is set and cemented at 500 ft. in 17¼-in. hole. Although the 2,500 ft. of casing leaves several hundred additional feet of shale section to be drilled, the chances of much trouble in that part of the hole are not great.

The general trend, however, is toward less casing. The practice of several companies now is to set a short upper surface string consisting of from two to three joints (50 to 70 ft.) of 16-in. pipe, for which 22-in. hole is drilled. Then, 13¾-in. hole is drilled to the first good shale zone below 1,000 ft. where either 9⅞-in. or 10¾-in. casing is set for the intermediate string. Precaution is taken to have from 200 to 300 ft. of solid, unfractured shale above the seating point so that the cement will rise at least that high behind the pipe without loss to the formation, and thus provide a secure anchor for the bottom of the string. With this program, these operators feel that they not only effect a substantial saving in pipe but are in a better position to cement or otherwise seal off any additional fractured zones that might be encountered in the remainder of the section than they would be in a longer open hole.

In one of the most recent wells started, the intermediate string has been eliminated. Approximately 600 ft. of 13⅜-in. casing was cemented in 17¼-in. hole as a surface string. The plan then was to drill a 9-in. "pilot" hole through the shale, and, if trouble were encountered with fractured zones and loss of circulation, go back and ream the hole to 9⅞-in. and run an intermediate string of 8⅝-in. casing. However, relative-

ly little trouble was experienced and the 9-in. hole has been carried on down without the extra string.

In all cases both the first surface casing and the intermediate string are cemented to the top. Usually no particular difficulty is involved in cementing the short upper surface string, and from 50 to 150 sacks are adequate, depending on the length of the string. However, on the intermediate string, it generally is necessary to fill behind the pipe by placing or pumping cement into the annulus, using a 1-in. pipe for the purpose. This often has to be done in stages to seal off any loss of circulation zones. In doing this the practice first is to pump enough cement in the conventional manner around the casing shoe to insure that the level of the cement will rise at least 200 to 300 ft. behind the pipe. Then, after this has had opportunity to set, the 1-in. pipe will be run into the annulus.

The chief problem in drilling the second phase of the hole taking in the intermediate series of formation below the shale section to the producing horizon is the control of water flows in the Dakota sand. This sand is immediately below the shale section. It originally was a gas sand and in early development of the field several wells were completed in it. From it there also have been several blowouts. Although the gas has been drowned out, the remaining water flow attains a well-head pressure of approximately 250 psi., and is particularly hard to control if it is allowed to start.

Complicating the control is the fact that when mud weight is built up sufficiently high to hold the water flow there is danger that fractured zones in the uncased section of the overlying shales will be broken into causing a recurrence of loss-of-circulation trouble. In turn, this will allow the water flow to come into the hole.

For winter operation, drilling rigs, including pumps, in Rangely field generally are completely enclosed

Consequently a very close balance of mud weight pressure is required. A mud weight of 10.5 lb. per gallon is advisable for maximum safety in controlling the pressure although it is desirable to limit the weight to 9.8 lb. to prevent loss of circulation. By gradually building up the weight to this figure, starting when about 100 ft. above the top of the Dakota sand, and by careful control of the consistency of the mud while sand is exposed it has been possible so far to negotiate the section with a reasonable degree of safety. It is considered important to hold the water loss of the mud under 15 cc. in 30 minutes at 100 psi. Viscosity is maintained around 45 seconds.

Drilling Below Red Beds

Mud control is not especially difficult, however, until the Red Bed section is reached. This section, topped at depths of from 4,600 to 4,800 ft., is about 400 to 500 ft. thick and has considerable anhydrite and gyp. The calcium sulfate readily contaminates the mud, causing flocculation if not treated. Use of from 100 to 125 sacks of anhydrox or barium carbonate ordinarily is required to keep the mud in shape.

Formations through this second stage of drilling are somewhat harder than through the upper shale section and require on the average between 35 and 40 rock bits. Drilling time under favorable conditions runs from 30 to 35 days with the best time to date being 25 days. The best time to date from the surface to the producing horizon has been 55 days, with the average running considerably above this.

The oil string of casing is set in the top of the oil sand at a point below the gas-oil contact, which is at a subsea depth of 305 to 310 ft., or less than 75 ft. below the top at the highest point. However, the gas cap covers a very small area at the apex and in most wells the casing can be set immediately on top of the sand, usually from 5,500 to 5,800 ft. In all wells so far, 7-in. o.d. pipe has been run for this string. Sufficient cement, 800 to 1,100 sacks, is used to bring the top of the cement behind the pipe above the Dakota sand. The purpose of this is to shut off the Dakota water and protect the Morrison sand, a potentially productive formation below the Dakota sand, and also to protect the casing from possible corrosion by the water in the Dakota.

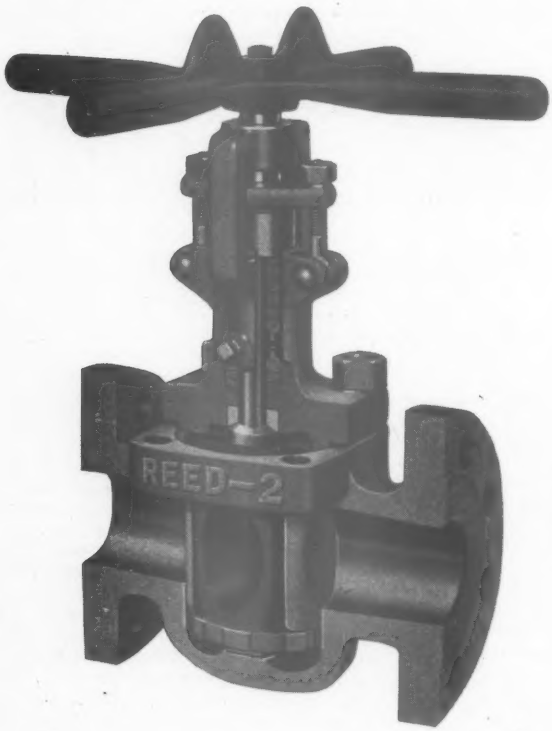
Drilling of the producing section is designated as a phase of completing wells since the manner in which the formation is drilled has a direct bearing on the productivity of the well. For this reason, this stage of operation will be discussed in a later article dealing with completion practices in the field.

All water, as well as oil and gas lines, in Rangely field are buried to minimum depth of 5 ft. to prevent chance of freezing

H. A. Birdwell, formerly at Big Spring, Tex., for Sunray Oil Corp., is the company's new district superintendent at Odessa, Tex. He is succeeded at Big Spring by **M. E. Perry.**

REED Steel VALVES

The quarter-turn double-disc GATE VALVE especially designed for ease of operation



Reed valve discs are not affected by expansion or contraction of the valve body and ease of operation is assured under the most severe service conditions and widest temperature changes.

Each valve has a positive position indicator—is quarter-turn operated with non-rising stem and can be installed in any position.

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Reed Steel Valves are interchangeable with wedge steel valves and are supplied with A. S. A. standard for O. S. & Y. wedge gate valves.

ALSO AVAILABLE WITH FULL FABRICATED JACKET FOR HANDLING VISCOUS FLUIDS

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P. O. BOX 2119 **ROLLER BIT COMPANY,** HOUSTON, TEXAS

Interpretation of Laboratory Analytical and Volumetric Data—in Terms of Field Measurements

*by R. H. Olds, B. H. Sage, and W. N. Lacey**

IN recent years there has been a rapidly growing recognition of the value of laboratory data concerning the volumetric and phase behavior of naturally occurring hydrocarbon mixtures. The decreasing rate of discovery of new oil reserves and the increasing demands upon production require that more efficient and more effective procedures for petroleum recovery be employed. The estimation of oil reserves, the anticipation of the future behavior of reservoirs, and the selection of optimum operating conditions such as proper well spacing, flow rates, and pressure maintenance all depend to a large extent upon accurate information regarding the properties of the materials to be handled. Available correlations and methods for predicting the behavior of multicomponent hydrocarbon mixtures[1,2,3,4,5,6] are unreliable in the vicinity of the critical state and in the region of retrograde phase behavior.[7] Many petroleum reservoirs with gas-oil ratios of 3,000 cu. ft. per barrel or higher and especially condensate fields at pressures above 3,000 psi. are found to exist at states in the region of retrograde phase phenomena not far removed from the critical state. Accurate volumetric and phase data in such cases can be obtained only by recourse to a laboratory investigation of representative samples of the hydrocarbon materials.

Translating Laboratory Results

The petroleum engineer frequently encounters difficulty in translating the laboratory results into terms which have meaning and value to him in the treatment of field production problems. His difficulty is primarily one of becoming conversant with the nomenclature employed in computing and expressing the data obtained in the laboratory. The following discussion outlines in some detail the computational procedures adopted by this laboratory in the experimental investigation of natural hydrocarbon systems. It is not to be construed that any new contribution to the subject is implied by the material given here. The intention is only to clarify and present for criticism a mode of approach which has developed as the result of several years' experience in this work. Numerical data from an investigation of a typical set of petroleum samples have been included in the tabular forms for the calculations in order to assist the reader should he wish to follow the procedures in detail.

A schematic diagram of a typical surface separator system of a well is given in Fig. 1. The well-production fluid is throttled into the primary or high-pressure separator which is regulated to operate at a constant pressure of about 400 to 500 psi. The gas and liquid phases which appear in the primary separator will be called the "trap gas" and "trap liquid," respectively. The trap liquid is often passed into a secondary or low-pressure separator which is regulated to operate at somewhat less than 100 psi., although sometimes the secondary separator is omitted and the trap liquid delivered directly to the stock tank at approximately atmospheric pressure. The combined gases from all stages of separation will be called the "surface gas" in this discussion, and the crude oil in the stock tank will be called the "tank oil." These should be distinguished from the "plant product" gas and oil to be discussed later.

Samples of the trap gas, trap liquid, and tank oil are analyzed by fractional distillation, and their compositions are reported in terms of the weight fractions or mole fractions of the light paraffin hydrocarbons from methane through heptane, all heavier components being lumped into a single constituent called "octanes-and-heavier." In addition to the compositions of the samples it is desirable to know the specific gravities at standard surface conditions (60° F., 14.73 psia.; hereafter designated by S.S.C.) of the tank oil and of the octanes-and-heavier residue from the fractionation analysis of the trap liquid, together with the average molecular weight of this residue.

Required Observations

At the time of sampling, the following observations of the well operation are required:

1. Static pressure and temperature in the well at the producing horizon.
2. Rate of production of surface gas.
3. Rate of production of tank oil.

Under steady-state operation of the well the gas-oil ratio based upon the tank oil is expressed as follows:

$$G/O = \frac{\text{Surface gas rate (cu. ft. per day at S.S.C.)}}{\text{Tank-oil rate (bbl. per day at S.S.C.)}}$$

In the laboratory study of a system the samples of trap gas and trap liquid are combined in various proportions, and the volumetric and phase behavior of the resulting mixtures is experimentally determined. The correlation of the properties of these arbitrary mixtures with the particular mixture of trap gas and trap liquid which corresponds to the well-production fluid requires that the equivalent gas-oil ratios of the mixtures be known. The procedure for obtaining this information is outlined below.

The principles of elementary stoichiometry are employed with the

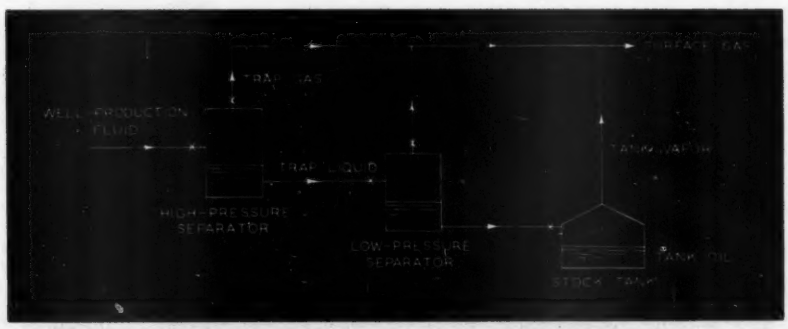

Fig. 1—Schematic diagram of surface separator system of a well

*California Institute of Technology. Paper originally presented before the Los Angeles chapter, American Society of Mechanical Engineers.

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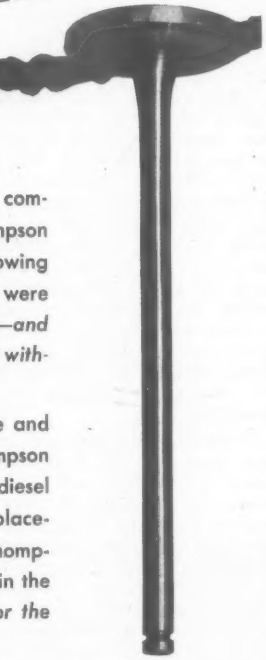

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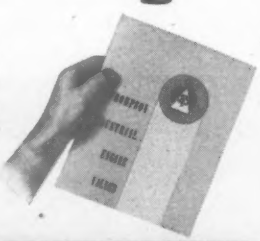

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TABLE 1—COMPOSITION OF A MIXTURE OF TRAP SAMPLES

Weight Fraction Trap Gas = N_G = 0.6022

Weight Fraction Trap Liquid = N_L = 0.3978

Component—	$N_{K,G}$	$N_{K,L}$	$N_G N_{K,G}$	$N_L N_{K,L}$	$N_{K,M}$	M_K	$N_{K,M}/M_K$	$N_{b,M}$
Methane	0.7283	0.0213	0.4386	0.0085	0.4471	16.042	0.027871	0.7947
Ethane	0.0753	0.0113	0.0453	0.0045	0.0498	30.069	0.001656	0.0473
Propane	0.0677	0.0280	0.0408	0.0111	0.0519	44.095	0.001177	0.0336
i-Butane	0.0388	0.0334	0.0234	0.0133	0.0367	58.121	0.000631	0.0180
n-Butane	0.0281	0.0301	0.0169	0.0120	0.0289	58.121	0.000497	0.0142
i-Pentane	0.0169	0.0408	0.0102	0.0162	0.0264	72.147	0.000366	0.0104
n-Pentane	0.0094	0.0254	0.0057	0.0101	0.0158	72.147	0.000219	0.0062
Hexanes	0.0103	0.0924	0.0062	0.0368	0.0430	86.173	0.000499	0.0142
Heptanes	0.0112	0.1079	0.0067	0.0429	0.0496	100.200	0.000495	0.0141
Octanes+, G	0.0027	.....	0.0016	.....	0.0016	125.0*	0.000013	0.0004
Octanes+, L	.....	0.6094	.....	0.2424	0.2424	162.7†	0.001490	0.0425
Carbon dioxide	0.0113	.....	0.0068	.....	0.0068	44.010	0.000155	0.0044
Nitrogen	.....	.....	.....	.....	.....	28.016	.....	.....
Oxygen	.....	.....	.....	.....	.....	32.000	.....	.....
							Total =	0.035069

*Estimated from analysis of trap-gas sample. †Determined by freezing-point lowering of benzene.

assumption that the octanes-and-heavier portion of the trap liquid preserves its identity in the subsequent stages of separation and appears without loss in the tank oil. Experience in the study of systems of this nature has shown that the error occasioned by this assumption is negligible in comparison with uncertainties from other sources as the observation of production rates, the procurement of representative samples, and the analyses of the samples.

Consider a mixture composed of N_G weight fraction of trap gas and N_L weight fraction of trap liquid. The composition of the mixture in terms of its components is given by:

$$N_{K,M} = N_G N_{K,G} + N_L N_{K,L} \qquad (1)$$

where $N_{K,M}$, $N_{K,G}$, and $N_{K,L}$ represent the weight fractions of component K in the mixture, the trap gas, and the trap liquid, respectively. The tabular form for performing the operations indicated by Equation 1 and for expressing the results in terms both of the mole fraction and of the weight fractions of the components is given in Table 1.

Consider a separation of a mixture of trap-gas and trap-liquid samples into gas and liquid constituents such that the composition of the liquid constituent is identical with that of the tank oil; the gas constituent, consisting of all material not included in the liquid constituent, is analogous to the surface gas. The gas-oil ratio of the mixture may then be defined as the ratio of the volume of gas constituent, measured in cubic feet at S.S.C., to the volume of liquid constituent, measured in barrels at S.S.C. The evaluation of this quantity is accomplished as follows: Take as the basis of computation 1 lb. of the mixture. Assuming no loss of the octanes-and-heavier portion of the trap liquid in passing from trap liquid to tank oil, the weight in pounds of tank oil per pound of mixture is:

$$m_O = \frac{N_L N_{s,L}}{N_{s,O}} \qquad (2)$$

If $V_O°$ is the specific volume of the tank oil at S.S.C., then the volume $\underline{V_O°}$ of the tank oil per pound of mixture is:

$$\underline{V_O°} = m_O V_O° = \frac{N_L N_{s,L}}{N_{s,O}} V_O° \qquad (3)$$

where $N_{s,L}$ and $N_{s,O}$ represent the weight fractions of octanes-and-heavier residue in the trap liquid and tank oil, respectively.

Computing Components

The quantity of any component in the gas constituent is computed from the difference in quantity of that component in the mixture and in the tank oil derived from the mixture, thus:

$$m_{K,G'} = N_{K,M} - m_{K,O} N_{K,M} = \frac{N_L N_{B,L}}{N_{B,O}} N_{K,O} \qquad (4)$$

where $m_{K,G'}$ represents the weight of component K in the gas constituent per pound of mixture. If $V_{K°,g}$ is the specific volume of component K as a gas at S.S.C., then, assuming ideal mixtures, the volume of the gas constituent per pound of mixture is:

$$\underline{V^0_{G'}} = \sum_K m_{K,G'} V^0_{K,g} = \sum_K \left(N_{K,M} - \frac{N_L N_{B,L}}{N_{B,O}} N_{K,O}\right) V^0_{K,g} \qquad (5)$$

Therefore, the gas-oil ratio of the mixture is:

$$G/O = 5.6146 \frac{\underline{V_{G'°}}}{\underline{V_O°}} \qquad (6)$$

A tabular form for systematically evaluating the quantities of Equation 6 is given in Table 2.

In order to determine the composition of the well-production mixture—that is, the weight fraction of trap gas contained in the mixture which corresponds to the total well-production fluid—it is necessary only to compute the gas-oil ratios of several arbitrarily chosen mixtures of the trap samples, plot the gas-oil ratios versus the weight fraction of trap gas, and from a smooth curve through the computed points determine by graphical interpolation the weight fraction of trap gas corresponding to the reported gas-oil ratio of the well. A more elegant way of accomplishing this analytically is given at the close of this discussion.

Conducting Laboratory Study

The laboratory study of mixtures of the trap samples is most conveniently conducted on a gravimetric basis. For this reason the volumetric behavior of the system is reported in terms of specific volumes expressed as cubic feet per pound. Field practice in petroleum engineering has established the convention of expressing the volumetric properties of the system in terms of formation volumes. The formation volumes is defined as the number of barrels of mixture at any specified state which yields 1 bbl. of tank oil at S.S.C.

The ratio of the formation volume to the specific volume may be evaluated as follows: Consider 1 lb. of mixture whose specific volume at the state under consideration is V and

TABLE 2—GAS OIL RATIO OF A MIXTURE OF TRAP SAMPLES

Basis: Tank Oil*

Component—	$N_{K,M}$	$N_{K,O}$	$m_{K,O}$	$m_{K,G'}$	$V_{K°,g}$	$\underline{V_{K°,G'}}$
Methane	0.4471	.....	.....	0.4471	23.513	10,513
Ethane	0.0498	.....	.....	0.0498	12.491	0.622
Propane	0.0519	0.0035	0.0012	0.0507	8.454	0.429
i-Butane	0.0367	0.0111	0.0039	0.0328	6.325	0.207
n-Butane	0.0289	0.0172	0.0060	0.0229	6.313	0.145
i-Pentane	0.0264	0.0285	0.0099	0.0165	5.022	0.083
n-Pentane	0.0158	0.0310	0.0107	0.0051	5.007	0.026
Hexanes	0.0430	0.0785	0.0272	0.0158	4.118	0.065
Heptanes	0.0496	0.1314	0.0456	0.0040	3.479	0.014
Octanes+, G	0.0016	.....	.....	0.0016	†3.029	0.005
Octanes+, L	0.2424	0.6988	0.2424	.....	.....	.....
Carbon dioxide	0.0068	.....	.....	0.0068	8.551	0.058
Nitrogen	.....	.....	.....	.....	13.505	.....
Oxygen	.....	.....	.....	.....	11.824	.....
					Total =	12.167

G/O = 9,215 cu. ft. per bbl.
v/V = 134.9 lb. per cu. ft.

*Specific gravity of tank oil for this numerical example is 0.7503 at 60° F. and 14.73 psi. Hence, $V_O°$ = 0.02137 cu. ft. per lb. †Calculated from perfect gas law using estimated average molecular weight.

whose formation volume at that state is v. Equation 3 gives the volumes of tank oil per pound of mixture, and since V is the volume of mixture per pound of mixture, it is necessary only to take the ratio of the latter to the former to obtain the formation volume, thus:

$$v = \frac{V}{V_o^\circ} = \frac{N_{s,o}\, V}{N_L N_{s,L}\, V_o^\circ} \qquad (7)$$

Hence, the ratio of the formation volume to the specific volume is:

$$\frac{v}{V} = \frac{N_{s,o}}{N_L N_{s,L}\, V_o^\circ} \qquad (8)$$

Expression of Gas-Oil Ratios

In the foregoing discussion results were based upon the tank oil, which basis most nearly conforms to actual field practice. However, the processing of materials by the refinery may require that the data be expressed on a different basis. In particular, expression of gas-oil ratios and formation volumes in terms of an arbitrarily defined "plant product" oil is one such basis. Consider the case of a plant-product oil which is composed of 80 per cent of the butanes, 99 per cent of the pentanes, and all of the remaining heavier components of the total well-production fluid. Before attempting to compute the gas-oil ratio on this basis, the composition in terms of the weight fractions of the components and the specific volume of the plant-product oil must be determined. Letting $N_{K,w}$ and $N_{K,P}$ represent the weight fractions of component K in the well-production fluid and in the plant product, respectively, it may be seen that the following relations are prescribed by the definition of the plant-product oil:

$$N_{1,P} = N_{2,P} = N_{3,P} = 0$$

$$N_{4,P} = 0.80\,\frac{N_{4,w}}{m_P}$$

$$N_{5,P} = 0.99\,\frac{N_{5,w}}{m_P}$$

$$N_{6,P} = \frac{N_{6,w}}{m_P} \qquad (9)$$

$$N_{7,P} = \frac{N_{7,w}}{m_P}$$

$$N_{8,P} = \frac{N_{8,w}}{m_P}$$

in which $m_P = 0.80\, N_{4,w} + 0.99\, N_{5,w} + N_{6,w} + N_{7,w} + N_{8,w}$

The quantity m_P is the weight of plant-product oil per pound of total well-production fluid. The specific volume of the plant-product oil is computed by assuming ideal mixing of the components in the liquid state and combining the specific volumes of the liquid components at S.S.C. in proportion to their weight fractions in the plant-product oil, thus:

$$V_P^\circ = \sum_K V_{K,l}^\circ\, N_{K,P} \qquad (10)$$

in which V_P° is the specific volume of the plant-product oil and $V_{K,l}^\circ$ is the specific volume of component K in the liquid state at S.S.C. Table 3 gives a convenient form for performing the operations indicated by Equations 9 and 10.

Evaluating Gas-Oil Ratios

The gas-oil ratio upon a plant-product basis may now be evaluated. The form of the calculations is identical with that based upon the tank oil. The equations listed below are essentially a repetition of those previously derived except that quantities relating to the plant-product oil are substituted for the equivalent tank-oil terms:

$$m_P = \frac{N_L N_{8,L}}{N_{8,P(L)}} \qquad (11)$$

$$V_P^\circ = m_P V_P^\circ = \frac{N_L N_{8,L} V_P^\circ}{N_{8,P(L)}} \qquad (12)$$

$$m_{K,G} = N_{K,M} - m_{K,P} = N_{K,M} - \frac{N_L N_{8,L}}{N_{8,P(L)}}\, N_{K,P} \qquad (13)$$

$$V_G^\circ = \sum_K m_{K,G}\, V_{K,l}^\circ = \sum_K \left(N_{K,M} - \frac{N_L N_{8,L}}{N_{8,P(L)}}\, N_{K,P}\right) V_{K,l}^\circ \qquad (14)$$

$$G/O = 5.6146\,\frac{V_G^\circ}{V_P^\circ} \qquad (15)$$

$$\frac{v}{V} = \frac{N_{8,P(L)}}{N_L N_{8,L} V_P^\circ} \qquad (16)$$

where $N_{8,P(L)}$ represents that part of the octanes-and-heavier of the plant-product oil contributed by the trap liquid. The tabular form for computing the gas-oil ratio of a mixture on the plant-product basis is given in Table 4, although the similarity to the tabular form based upon the tank oil is apparent.

The procedures developed in this discussion are adaptable to the evaluation of gas-oil ratios and formation volumes on any basis whatsoever from heptane-free to methane-free oil. The value of reporting the volumetric properties of a system in terms of specific volumes is brought out by the fact that specific volumes are independent of such arbitrary concepts as tank-oil and plant-product bases. By computing the proper conversion factor of the form given by Equations 8 or 16, formation volumes on any basis may be computed from specific volumes.

A slight inconsistency in the procedure outlined should be pointed out. The calculation of gas-oil ratios and formation volumes for mixtures of the trap samples which differ in composition from the mixture which corresponds to the well-production fluid involves an approximation because the single tank-oil composition is assumed to apply to all cases. Strictly speaking, each mixture should have its own characteristic tank oil or plant product. The present state of knowledge does not permit a precise prediction of the tank oil corresponding to any mixture of the trap samples, but in the case of an arbitrarily defined quantity such as the plant product, it is not only feasible but desirable in the interest of exact analysis that the plant-product oil corresponding to each mixture be used as the basis of gas-oil ratio and formation volume when dealing with mixtures significantly different from the well-production fluid.

Precise Computations

As a refinement in the use of Equations 5 and 6 for computing the gas-oil ratio of a mixture of trap samples, the equations may be rearranged and used to compute the composition of the well-production fluid by precise analytical means without the necessity of a graphical interpolation. Starting from Equation 5, the following changes may be made:

TABLE 3—COMPOSITION AND SPECIFIC VOLUME OF PLANT PRODUCT

Component—	$N_{K,w}$	$m_{K,P}$	$N_{K,P}$	M_K	$N_{K,P}/M_K$	$\underline{N}_{K,P}$	V_K°,l	$N_{K,P}V_K^\circ,l$
Methane	0.4471	.....	.....	16.042	.....	.....	.....	.....
Ethane	0.0498	.....	.....	30.069	.....	.....	0.040085	.....
Propane	0.0519	.....	.....	44.095	.....	.....	0.031501	.....
i-Butane	0.0367	0.0294	0.0683	58.121	0.001175	0.1272	0.028429	0.00194
n-Butane	0.0289	0.0231	0.0536	58.121	0.000922	0.0998	0.027455	0.00147
i-Pentane	0.0264	0.0261	0.0606	72.147	0.000840	0.0910	0.025672	0.00156
n-Pentane	0.0158	0.0156	0.0362	72.147	0.000502	0.0544	0.025408	0.00092
Hexanes	0.0430	0.0430	0.0998	86.173	0.001158	0.1254	0.024155	0.00241
Heptanes	0.0496	0.0496	0.1151	100.200	0.001149	0.1244	0.023288	0.00268
Octanes+, G	0.0016	0.0016	0.0037	*125.000	0.000030	0.0032	*0.022815	0.00008
Octanes+, L	0.2424	0.2424	0.5627	†162.700	0.003458	0.3746	‡0.020449	0.01151
Carbon dioxide	0.0068	.....	.....	44.010	.....	.....	.....	.....
Nitrogen	.....	.....	.....	28.016	.....	.....	.....	.....
Oxygen	.....	.....	.....	32.000	.....	.....	.....	.....
		$m_P = 0.4308$			Total = 0.009234			$V_P^\circ = 0.02257$

*Estimated. †Calculated from freezing-point lowering of benzene. ‡Calculated from measured specific gravity.

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$$\underline{V}^{o}_{G} = \sum_K \left[N_G N_{K,G} + (1-N_G) N_{K,L} - \frac{(1-N_G)N_{8,L}}{N_{8,O}} N_{K,O} \right] V^{o}_{K,g} \quad (17)$$

$$\underline{V}^{o}_{G} = \sum_K (N_{K,L} - \frac{N_{8,L}}{N_{8,O}} N_{K,O}) V^{o}_{K,g} + N_G \sum_K (N_{K,G} - N_{K,L} + \frac{N_{8,L}}{N_{8,O}} N_{K,O}) V^{o}_{K,g} \quad (18)$$

$$\underline{V}^{o}_{G} = \sum_K N_{K,L} V^{o}_{K,g} - \frac{N_{8,L}}{N_{8,O}} \sum_K N_{K,O} V^{o}_{K,g}$$

$$+ N_G \left(\sum_K N_{K,G} V^{o}_{K,g} - \sum_K N_{K,L} V^{o}_{K,g} + \frac{N_{8,L}}{N_{8,O}} \sum_K N_{K,O} V^{o}_{K,g} \right) \quad (19)$$

$$\underline{V}^{o}_{G} = \alpha + \beta N_G \quad (20)$$

where

$$\alpha = \sum_K N_{K,L} V^{o}_{K,g} - \frac{N_{8,L}}{N_{8,O}} \sum_K N_{K,O} V^{o}_{K,g}$$

and

$$\beta = \sum_K N_{K,G} V^{o}_{K,g} - \alpha$$

Equation 6 may be rewritten in terms of these quantities to give:

$$G/O = \frac{\alpha + \beta N_G}{A(1-N_G)} \quad (21)$$

where

$$A = \frac{N_{,L} V_o^{\circ}}{5.6146\, N_{s,o}}$$

This equation may be solved for N_G to yield:

$$N_G = \frac{A(G/O) - \alpha}{A(G/O) + \beta} \quad (22)$$

The composition of the well-production fluid in terms of the weight fraction of trap gas in the mixture may be computed from Equation 22 by substituting the observed value of the gas-oil ratio into the equation. A tabular form for evaluating the constants α, β, and A is given in Table 5.

Equations 21 and 22 may be used to compute gas-oil ratios and compositions of mixtures of the trap samples differing from the well-production fluid. However, since the equations are based upon a tank oil fixed composition, they must be regarded as only qualitatively descriptive of actuality when applied to mixtures very much different from the well-production mixture.

Nomenclature

α = numerical constant in Equations 20, 21, and 22
β = numerical constant in Equations 20, 21, and 22
Σ = symbol indicating summation on the index K from 1 to n
G/O = gas-oil ratio, cu. ft. per bbl.
m = weight, lb.
M = molecular weight, lb. per mole
N = weight fraction
N = mole fraction
$\underline{v}$ = formation volume
V = specific volume, cu. ft. per lb.
$\underline{V}$ = total volume, cu. ft.

Superscript

o = standard surface conditions, 60° F., 14.73 psia.

Subscripts

1 = methane
2 = ethane
3 = propane
4 = butane
5 = pentane
6 = hexane
7 = heptane
8 = octanes-and-heavier
g = gaseous state
G = trap gas
G′ = gas constituent based on tank oil
G″ = gas constituent based on plant-product oil
K = component K
l = liquid state
L = trap liquid
M = mixture
O = tank oil
P = plant product
W = well production.

TABLE 5—EVALUATION ON CONSTANTS α, β, AND A

Component—	$V_K^{\circ}{}_{,g}$	$N_{K,G}$	$N_{K,O}V_K^{\circ}{}_{,g}$	$N_{K,L}$	$N_{K,L}V_K^{\circ}{}_{,g}$	$N_{K,O}$	$N_{K,O}V_K^{\circ}{}_{,g}$
Methane	23.513	0.7283	17.125	0.0213	0.501	.....	.....
Ethane	12.491	0.0753	0.941	0.0113	0.141	.....	.....
Propane	8.454	0.0677	0.572	0.0280	0.257	0.0035	0.030
i-Butane	6.325	0.0388	0.245	0.0334	0.211	0.0111	0.070
n-Butane	6.313	0.0281	0.177	0.0301	0.190	0.0172	0.109
i-Pentane	5.022	0.0169	0.085	0.0408	0.205	0.0285	0.143
n-Pentane	5.007	0.0094	0.047	0.0254	0.127	0.0310	0.155
Hexanes	4.118	0.0103	0.042	0.0924	0.381	0.0785	0.323
Heptanes	3.479	0.0112	0.039	0.1079	0.375	0.1314	0.457
Octanes+, G	*3.029	0.0027	0.008	...	...	...	.....
Octanes+, L	...	...	...	0.6094	.....	0.6988	.....
Carbon dioxide	8.551	0.0113	0.097	.....	.....	.....	.....
Nitrogen	13.505	.....	.....	.....	.....	.....	.....
Oxygen	11.824	.....	.....	.....	.....	.....	.....
Total			19.378		2.368		1.287

$\alpha = 1.246$ $\beta = 18.132$ $A = 0.003319$

*Calculated from perfect gas law using estimated average molecular weight.

Example: Let the gas-oil ratio = 9,215 cu. ft. per bbl. (tank-oil basis)

$$\text{Then } N_G = \frac{A(G/O) - \alpha}{A(G/O) + \beta} = \frac{0.003319 \times 9{,}215 - 1.246}{0.003319 \times 9{,}215 + 18.132} = 0.6022$$

TABLE 4—GAS-OIL RATIO OF A MIXTURE OF TRAP SAMPLES
Basis: Plant Product

Component—	$N_{K,M}$	$N_{K,P}$	$m_{K,P}$	$m_{K,G''}$	$V_K^{\circ}{}_{,g}$	$\underline{V}_K^{\circ}{}_{,G''}$
Methane	0.4471	.....	.....	0.4471	23.513	10.513
Ethane	0.0498	.....	.....	0.0498	12.491	0.622
Propane	0.0519	.....	.....	0.0519	8.454	0.439
i-Butane	0.0367	0.0683	0.0294	0.0073	6.325	0.046
n-Butane	0.0289	0.0536	0.0231	0.0058	6.313	0.037
i-Pentane	0.0264	0.0606	0.0261	0.0003	5.022	0.002
n-Pentane	0.0158	0.0362	0.0156	0.0002	5.007	0.001
Hexanes	0.0430	0.0998	0.0430	.....	4.118	.....
Heptanes	0.0496	0.1151	0.0496	.....	3.479	.....
Octanes+, G	0.0016	0.0037	0.0016	.....	*3.029	.....
Octanes+, L	0.2424	0.5627	0.2424	.....	.....	.....
Carbon dioxide	0.0068	.....	.....	0.0068	8.551	0.058
Nitrogen	.....	.....	.....	.....	13.506	.....
Oxygen	.....	.....	.....	.....	11.824	.....
					Total =	11.718

G/O = 6,677 cu. ft. per bbl.
v/V = 102.9 lb. per cu. ft.

*Calculated from perfect gas law using estimated average molecular weight.

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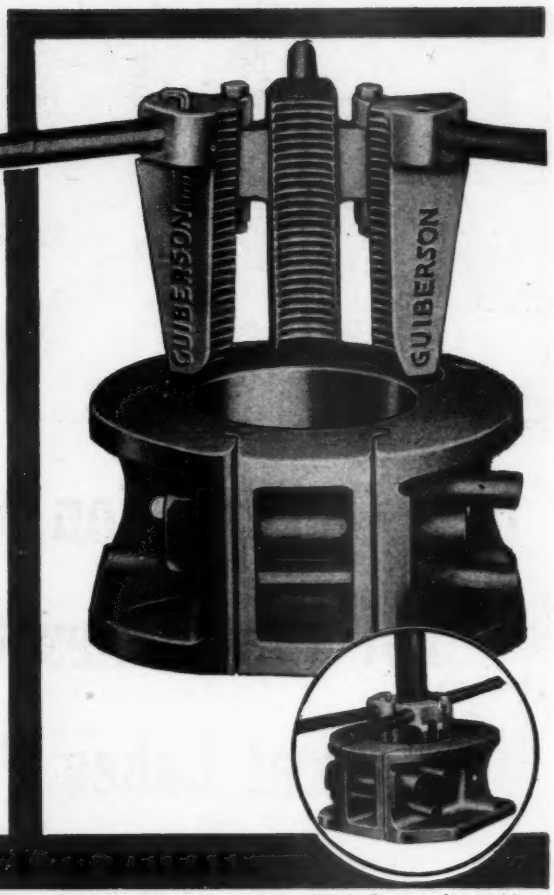


GUIBERSON'S TYPE B TUBING SPIDER

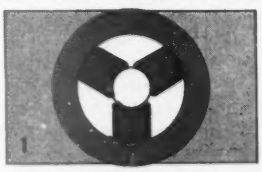
When running or pulling long strings of tubing, the wellman will appreciate the self-equalizing slips of the Guiberson Type B Tubing Spider. Gripping with jaws of steel with large slip area and full contact around the tubing, these slips assure a positive grip without distortion of the tubing or damage to its surface. The spider is designed and tested for loads up to 65 tons (20,000 feet of 2½" upset tubing).

Because of its exceptionally light weight, one man can handle the Type B Spider. Complete slip assembly weighs approximately 33 pounds; bowl assembly, 96 pounds. High quality steels throughout assure long life in the toughest service. Slips are machined and heat-treated to a surface hardness of 57 Rockwell "C". Recess in top flange of the bowl keeps the slip assembly upright and out of the way when pulling or running tubing. Squared edges of bottom flange will fit a rotary table. Two slots in the bottom flange permit bolting to well head. Gate lifts out easily when placing around tubing.

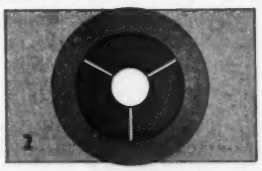
For positive performance, maximum protection, ease of operation, and ease of handling, put Guiberson's Type B Tubing Spider on your next job.

Slips made in 1", 1¼", 1½", 2", 2½", and 3" sizes.

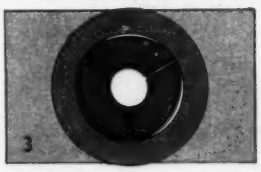
Unique design of Type "B" Tubing Spider slips assures a true fit in the bowl regardless of their vertical position and precludes sticking.



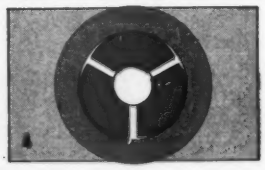
(1) The narrow back of Guiberson's Type B slip achieves a better load distribution, together with considerable range of setting levels within the bowl, assuring instant release when tubing is lifted. Wear is nominal and sticking is eliminated.



(2) The wide back of conventional slips fits the bowl properly at but one level.



(3) Conventional slips fit low when bowl or slip teeth are worn, or when used with undersized tubing, causing them to bind at corners, to stick in the bowl, to damage the tubing.



(4) Conventional slips fit high in the bowl when dirty or when used with oversized tubing, causing binding at center of slip and consequent sticking in bowl and damage to tubing.

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Boring a road crossing with the Dempsey punch equipment operated with pneumatic and hydraulic power

New Construction Methods For Pipe Lines Used On Great Lakes Project

by Paul Reed

EVIDENCE of recent developments in the improvement of pipe-line-construction operations may be observed in the project of Great Lakes Pipe Line Co. for laying 400 miles of 8-in. between Barnsdall, Okla., and Kansas City, and between Omaha, Neb., and Sioux Falls, S. D.

A distinctive feature of the undertaking is the extensive use of a special type of suspension bridge to safeguard creek crossings. Such a bridge is built with a substantial "A" frame on each bank to support two parallel cables holding cross pieces on which the pipe is held. A bridge of this kind is built to keep the pipe well above probable highwater levels to insure greater safety during flood periods than might be expected for a line buried in the creek bed.

The line is laid of National seamless pipe of 0.203-in. wall thickness. After cleaning with machines equipped with wire brushes, a primer coat is followed by two coats of Barrett water works enamel applied with a total thickness of 5/32 in. on top and 6/32 in. on the bottom; this is spirally wrapped with Johns-Manville asbestos felt.

During a recent trip to observe practices employed on the sections being constructed by O. E. Dempsey Construction Co. south of Independence, Kans., and by Oklahoma Contracting Co. north of there, it was found that detection of holidays was

Segmented bending shoe mounted on boom tractor of pipe gang

being done by instruments of the rolling spring type of both Crutcher-Rolfs-Cummings and Stearns designs. For holiday detection, the current from the transformer is 15,000 volts.

A new feature in construction is the use of the new type of C.R.C. segmented bending shoe observed in both the Dempsey and Oklahoma gangs. This shoe is installed at the base of the tractor-boom A-frame at approximately the same location as that of the pivoted shoes which contractors have widely used in recent years. Coil springs at each end hold the shoe in place. Experience in operating the shoe on this project indicates that it is effective in eliminating the possibility of buckling pipe. Bends of as much as 60° have been successfully made on the Great Lakes project with this equipment. Although the segmented shoe is considerably larger than the pivoted shoes, it may be readily removed from the tractor for periods when the tractor is not engaged in bending.

New pneumatic and hydraulic boring equipment for road crossings known as the "Dempsey punch" has been developed by the Dempsey organization. This is a definite departure from mechanical road-boring equipment previously used. Road crossings for pipe lines have been bored customarily by hand-operated punching or rotating equipment.

The cutting and dirt-holding part of the equipment known as the bit or "punch" of the new Dempsey machine is about the same size and shape as the usual road-boring auger. It travels 18 to 20 in., taking four or five to a hundred or more bites before emptying. The bit is ordinarily loaded in about 2 minutes during which it digs about 2 ft. of hole; the entire procedure of moving in and out of the hole and emptying the bit takes about 10 minutes for each "trip" or about 5 minutes per foot.

Experience on the Great Lakes project indicates that the bit now being used will cut satisfactorily even in hard shale. The Dempsey organization has been developing another type of bit which will be used later with the machine. It is expected that this improved bit will be more efficient and will be capable of cutting rock and other hard material. This punching machine has been designed to bore for any sizes of pipe used on the systems of the industry.

The Dempsey punch functions with three operations: (a) in digging, the punch is driven by pneumatic power; (b) the punch is fed into the hole as digging proceeds, by means of hand-operated hydraulic equipment; (c) the punch is moved in and out of the hole by a cable and a pneumatically operated cat head. Pneumatic power is furnished by a 105-ft. compressor operated at 110-120 psi. Injection of small quantities of alcohol in the air hose has prevented valve freezing.

For boring 8-in. holes at uncased road crossings and 12-in. holes at cased crossings for such a project, 16 men would ordinarily be required. With the Dempsey punch, there are only four men and a foreman.

Boring of ordinary road crossings is now done by the Dempsey machine in approximately the same length of time taken by hand methods. As further experience is gained in operating the Dempsey punching machine, it is expected that road boring will be done more rapidly.

Light metal shield of a type used by Oklahoma Contracting Co. for protecting each bell-hole welder against cold winds in winter weather

Tack welding in the pipe gang

Thoria-Alumina Catalyst Best for Isoparaffin Synthesis—Zinc Oxide Is Less Efficient, Less Expensive

A catalyst composed of alumina, Al_2O_3, and thoria, ThO_2, proved to be the best for use in German isoparaffin syntheses, a Navy report says. Increase of alumina content increases CH_4 formation. Zinc oxide and alumina catalyst shows slightly lower yields but better promise as a commercial catalyst, it is stated. Pressures of 4,500 psi. and temperatures of 788°-842° F. were used to form isoparaffins from carbon monoxide and hydrogen via the Fischer-Tropsch synthesis.

A THORIA-ALUMINA catalyst for the synthesis of isoparaffin hydrocarbons appears to be the most efficient yet discovered by German scientists for use in the Fischer-Tropsch reaction, according to reports from the U. S. Navy's Office of Research and Inventions.*

Thoria-alumina catalyst was shown by the institute researchers, Drs. Koch and Pichler, to be more efficient but is considerably higher in price which militates against its employment as a commercial catalyst, the Navy report says.

A comparison of the two catalysts shows that from thoria-alumina, in which the components are 1:4 by weight ratio, the best yields of all catalysts investigated were obtained. Higher gas velocities may be used with the catalyst, and alcohol-formation tendencies are at a minimum. This catalyst tends, however, to form greater amounts of deposited carbon. Little change in yields is shown when varying the catalyst component percentages between 20 and 40 per cent alumina, Al_2O_3. Increasing the alumina content tends to increase methane formation; addition of ½ per cent to 1 per cent of potassium carbonate, K_2CO_3, to the catalyst increases the over-all yield slightly, the investigation proved.

Zinc oxide-alumina shows slightly lower yields but holds more promise as a commercial prospect, the Germans found. It produces about 10 per cent of alcohols, but shows a lower carbon deposition tendency. It also forms more methane with increase of alumina content. Changing the alumina content from a ratio of 2:1 to one of 1:2 shows little change of yield; addition of potassium carbonate appears to give no increase in yields.

The thoria catalyst is formed by precipitating thoria and alumina from solutions of their nitrates. To a boiling solution of the two nitrates half the volume of a boiling solution of sodium carbonate of strength sufficient to give stoichiometric precipitation of the oxides in the ratio of one thoria to four alumina. The more dilute the solutions the more dense the precipitate. After washing and drying, the catalyst is sized to 2-4 mm. The zinc-oxide-type catalyst is prepared in the same manner, except that the mixed nitrate solution is added to the carbonate solution, and the resulting catalyst shows increased liquid hydrocarbon yields.

An alternative method of making the thoria catalyst is to form sodium aluminate and then precipitate alumina with sulfuric acid. The hydroxide of thorium is precipitated, the two precipitates are washed separately, then mixed while wet, dried at 212° F. in air, and reduced to the same particle size.

Synthesis of Isoparaffins

For synthesizing isoparaffins with these catalysts it was reported that pressures of 300 atm. (4,500 psi.) and temperatures ranging from 420° to 450° C. (788°-842° F.) are best. Yield drops rapidly as pressures go below 4,500 psi.; reaction will occur at pres-

*Tech. Report No. 110-45, "Wartime Research on Synthetic Fuels by the Kaiser Wilhelm Institut fur Kohlenforschung," by U. S. Naval Technical Mission in Europe.

Fuller's earth: extruded rods and three varying mesh sizes from same

sures as low as 450 psi. but at increasingly low rates as pressure is reduced. Strangely, as pressures increase above 4,500 psi. the percentages of oxygen-containing products increases until at 15,000 psi. the entire product is dimethyl ether, these researchers found. Temperatures below 450° C. (842° F.) show increases of alcohol and unsaturate production and decrease in carbon deposition on the catalyst. Above 450° C. the reaction rate increases rapidly, the products are mainly naphthenic, and carbon deposition becomes excessive.

The composition of synthesis gas which has given best results with these catalysts has a ratio of 1.2 carbon monoxide to 1 hydrogen. Increasing the hydrogen ratio increases the production of methane. A reduction in the hydrogen ratio reduced the total yield. Gas velocities have been investigated rather thoroughly and it was found that the best yields are obtained when passing about 500 cu. ft. of synthesis gas per hour per cubic foot of catalyst in the reactor. This corresponds approximately to 10 l. of gas per hour per 20 cc. of catalyst. Increasing this approximate rate resulted in serious decreases in yield and increased the production of alcohols.

Evolution of heat in this isoparaffin synthesis is apparently the same as with the normal synthesis; that is, the method producing products of different molecular composition; the heat evolved is one-fifth of the heat of combustion of the products. Since the synthesis can be carried out in a 20°-30° C. temperature range this reduces the necessity for close temperature control, a necessity which is found normally in operation of the Fischer-Tropsch process. Sulfur is not so injurious in this operation as in most of the operations of the general process, although the researchers have not determined the maximum allowable percentage of sulfur.

Yields of Products

Operating with a zinc-oxide-alumina catalyst in the weight ratio of 1:4 and with a CO/H_2 ratio of 1 in the synthesis gas, at 4,500 psi. and 842° F., the following yields have been obtained, per cubic meter (35.314 cu. ft.), of synthesis gas:

Total yield, C_4s and higher	120-130 gm. (0.265 lb.)
C_3	20 gm. (0.036 lb.)
C_4 (90% isobutane)	50-80 gm. (0.11-0.176 lb.)
C_5+ (97% iso-)	30-60 gm. (0.66-0.13 lb.)

Notable in these average yields figures are the high percentages of isoparaffins reported in the liquid products. Such products will lend themselves to alkylation in the case of isobutane and isopentane as well as high-octane blending materials in motor fuels without further treatment.

Synthesis of Aromatics

Not too successful catalysts for the synthesis of aromatic hydrocarbons by the Fischer-Tropsch reaction are oxides of chromium, molybdenum and thorium, combined with 5-10 per cent of potassium carbonate. This latter ingredient was used to reduce carbon deposition, but the carbonate also reduces the catalytic activity of the oxides.

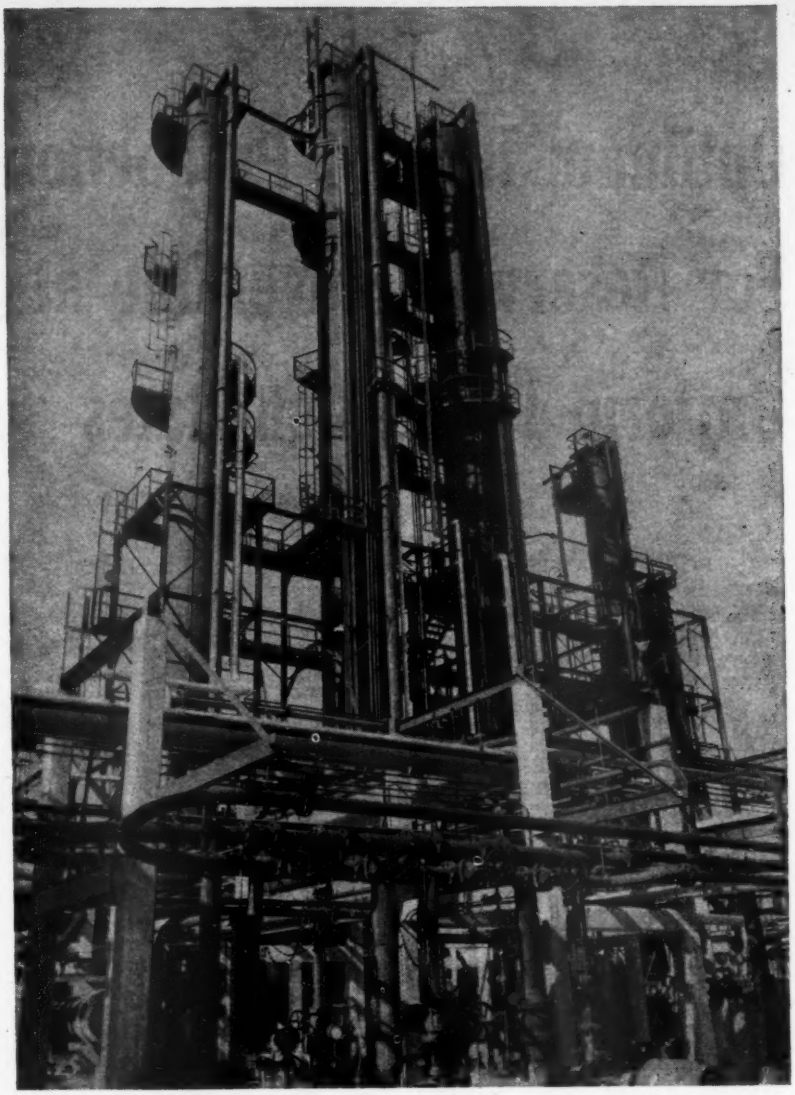
Treating a gas with a ratio of 1:1 of CO and hydrogen at 450 psi. and 932° F. the yield of product was only 8 to 10 gm. of liquid per cubic meter of gas, about 50 per cent aromatics and the remainder naphthenes, which latter were not identified individually. Large amounts of methane were formed, and a large proportion of the charge gas was unreacted and recovered as such. The aromatics were mainly toluene and xylenes and other alkyl benzenes. Because of the poor showing of this work, it was temporarily suspended by the institute in favor of more promising methods.

Iron as a Fischer-Tropsch Catalyst

For German purposes, their technologists insist that iron was employed as a catalyst only because of the shortage of chromium for that application. They claim that they knew of no commercial application of iron catalyst to a Fischer-Tropsch synthesis in Germany. Cobalt catalysts, it was stated, were superior, cleaner to use, and utilizable at lower temperatures, than iron.

Iron catalysts studied by the institute were made by precipitating the hydroxide from ferric nitrate solution by a soda solution, drying at 230° F., grinding and sizing. The sized material is treated with 1:1 CO/H_2 gas at 1.5 to 15 psia. pressure and 464°-608° F. temperature. This operation is said to form an iron carbide coating on the catalyst surface and is continued until a rapid drop in CO_2 carbon dioxide content of the exit gases shows the end of carbide formation. Particle sizes employed ranged from 2 to 5 mm. diameter.

Samples of the various catalysts used at the institute have been forwarded to the Bureau of Ships for investigation, but further data on them are not included in the report discussed here.



Toluene, synthesized catalytically by hydroforming operations, is extracted from total product stream in this plant of Pan-American Refining Corp., Texas City

Optimum Rate of Production For Reserve Recoverable at Uniform Production Rates

*by Park J. Jones**

NO. 21 OF A SERIES

THE optimum rate of production is the rate of production corresponding to which the present value of a reserve is a maximum. The optimum rate of production for that portion of an initial reserve which is recoverable at uniform rates is illustrated by examples for oil, condensate, and natural-gas reservoirs. The optimum rate of producing a portion of a reserve at a uniform rate is not necessarily the optimum rate for the entire reserve of which a portion is recoverable at declining rates of production.

The Economic Balance

DENOTE the reserve recoverable at uniform rates of production by unity. Let n equal the life of the reserve in years. Then the uniform rate of production Q is defined by 1/n. The present value P of a reserve recoverable at a uniform rate (see Part 20 of this series) is given by

$$P = \frac{Q}{i}(1 - e^{-i/Q})(1 - B) - \frac{Q}{X} \quad (1)$$

where i is the rate of interest; (1 — B), the income after taxes, royalty, and operating expenses in M.c.f.'s per M.c.f., or barrels per barrel, of gross production; X is the ratio of annual per well producing rate to per well investment. The quantity Q/X is the investment in wells and plant facilities. The quantity $(1 - e^{-i/Q})$ is the present worth factor for a reserve recoverable at a uniform annual rate Q and discounted at the rate i.

The curve in Fig. 21-1 is a particular solution of Equation 1. Present value after operating outgo and investment is plotted against uniform rates of production. Present value is in per cent of the reserve producible at uniform rates. Annual per well producing rate at the time production starts declining is equal to the per well investment. Operating outgo is 30 per cent of gross production. The rate of interest is 3 per cent.

The maximum present value is called the optimum present value. The rate of production corresponding to the optimum present value is the optimum rate. In Fig. 21-1, the optimum rate of production is about 9.1 per cent.

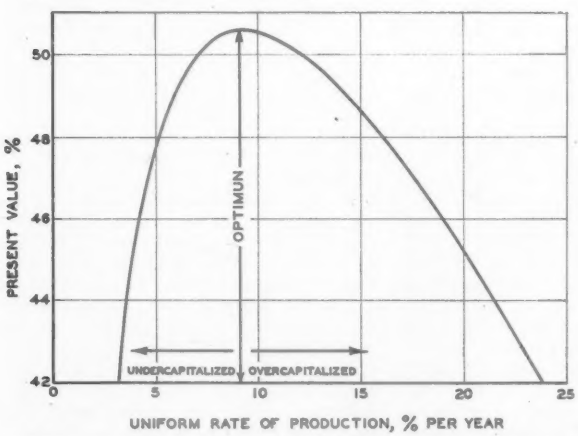
The Optimum Condition

The region under a present value curve to the left of optimum represents undercapitalized conditions. The region to the right of optimum represents overcapitalized conditions. Producers are interested primarily in optimum producing rates, investments, and present values. But the rate of change of present value at optimum with respect to the rate of production is equal to zero. This is the basis for estimating optimum rates of production. (See the appendix to this article.) The uniform rate of production for which

$$\frac{i}{1 - (1 + \frac{i}{Q})e^{-i/Q}} = X(1 - B) \quad (2)$$

is the optimum rate of production for the reserve recoverable at uniform rates. The curve in Fig. 21-2 is a solution of Equation 2. The optimum

*Production consultant, Houston.



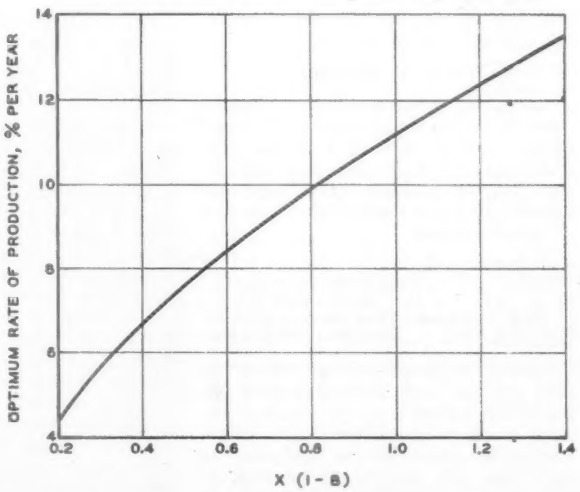


Fig. 21-1—(Left) The present value of a reserve recoverable at uniform rates of production; present value is in per cent of reserve after investment, taxes, royalty and operating expenses; rate of production is in per cent of initial reserve; operating outgo is 30 per cent of gross production; per-well annual producing rate is equal to per-well investment; interest is 3 per cent. Fig. 21-2—(Right) The optimum rate of production for the reserve recoverable at uniform rates of production vs. the product X(1 — B); X is the ratio of per-well annual producing rate to per-well investment; (1 — B) is income after taxes, royalty and operating expenses in M.c.f.'s per M.c.f., or barrels per barrel, of gross production; optimum rate of production is in per cent per year of the reserve recoverable at uniform rates

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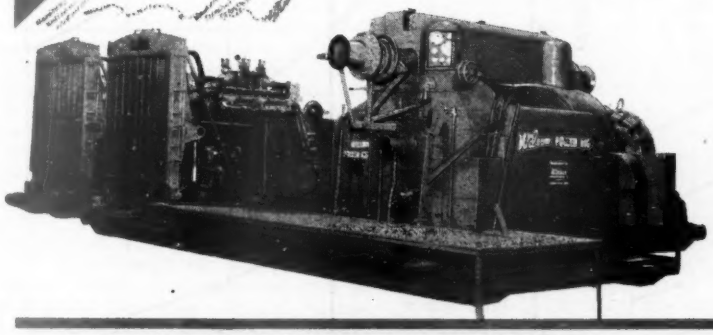

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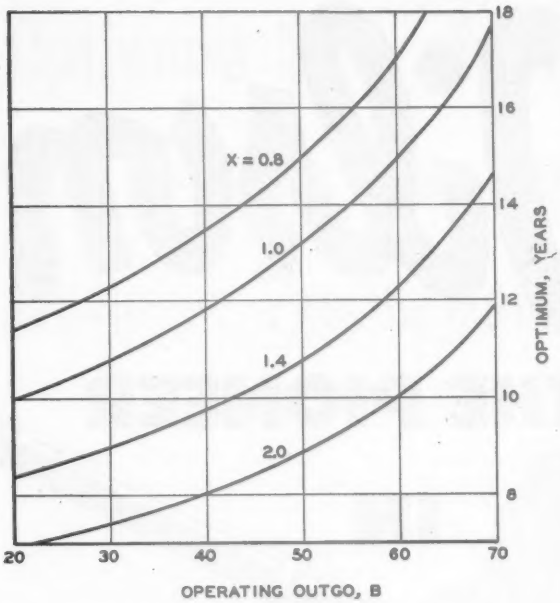

Fig. 21-3—The optimum life of the reserve recoverable at uniform rates of production vs. operating outgo in per cent of gross; X is per-well annual production in M.c.f.'s / M.c.f., or barrels/barrel, invested per well; interest rate is 3 per cent

rate of production, in per cent per year of the reserve recoverable at uniform rates, is plotted against the product X(1 — B). The quantity (1 — B) is income after taxes, royalty, and operating expenses and X is the ratio of per well annual rate of production to per well investment including plant investment. The rate of interest is 3 per cent.

Oil Reservoir with Slow Decline of Well-Producing Capacity

Sixty per cent of a 100,000,000-bbl. initial oil reserve is producible at uniform rates. Estimate the optimum rate of production for the 60,000,000-bbl. reserve producible at uniform rates if the conditions are as follows: Per well investment, 50,000 bbl.; per well average producing capacity at the time production from the reservoir starts declining, 100 bbl. per day; burden on production 30 per cent of gross.

Solution: In this example, the ratio X of annual per well producing capacity at the time production starts declining to the per well investment is defined by

$$X = 100(365)/50,000 = 0.73 \text{ bbl./bbl./year}$$

The product X(1 — B) is given by

$$X(1 - B) = 0.73(1 - 0.3) = 0.511$$

From Fig. 21-2, the optimum rate of production is 7.7 per cent annually. The corresponding rate of production relative to the 100,000,000-bbl. initial reserve is 60 per cent of 7.7 or 4.62 per cent per year.

The optimum daily rate of production is 0.77 times the 60,000,000-bbl. reserve or 4,620,000 bbl. per year or 12,700 bbl. per day. The optimum number of wells is 12,700/100 or 127. The optimum investment is 50,000(127) or 6,350,000 bbl. The optimum investment is 6.35 per cent of the initial reserve or 10.6 per cent of the reserve producible at 12,700 bbl. per day. The optimum conditions for the 60,000,000-bbl. reserve producible at uniform rates is not necessarily the optimum for the 100,000,000-bbl. reserve.

Cycling Operations for a Condensate Reservoir

Seventy per cent of a 40,000,000-bbl. initial condensate reserve is producible at uniform rates. Estimate the optimum plant size and number of producing wells for the 28,000,000-bbl. condensate reserve producible at uniform rates if the conditions are as follows: The investment per producing well is 300,000 bbl. This investment includes per well investment for plant and per producing well investment for injection wells and field lines. The per well average producing capacity at the time production starts declining is 500 bbl. per day. The burden on gross production for the producing and injection wells plus plant is 30 per cent of gross production. Plant recovery is 50 bbl. per million cubic feet of production.

Solution.—In this example, the ratio X of annual per well producing capacity at the time production starts declining to the per producing well investment is defined by

$$X = 500(365)/300,000 = 0.608$$

The product X(1 — B) is given by

$$X(1 - B) = 0.608(1 - 0.3) = 0.425$$

From Fig. 21-2, the optimum rate of

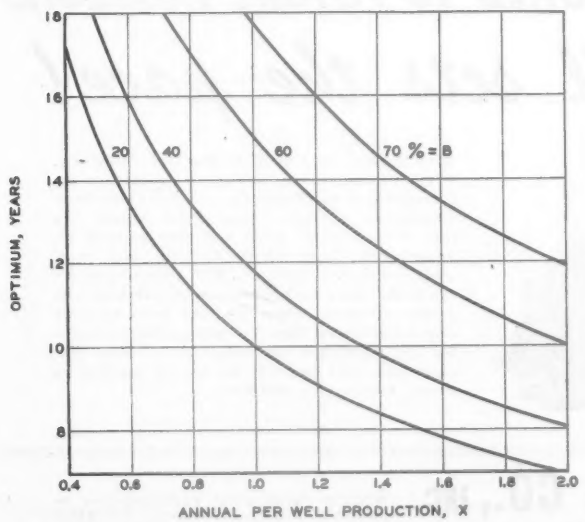

Fig. 21-4—The optimum life for the reserve recoverable at uniform rates of production vs. annual per-well production in M.c.f.'s/M.c.f., or barrels/barrel, invested per well; B is the burden on gross production in per cent of gross; interest rate is 3 per cent

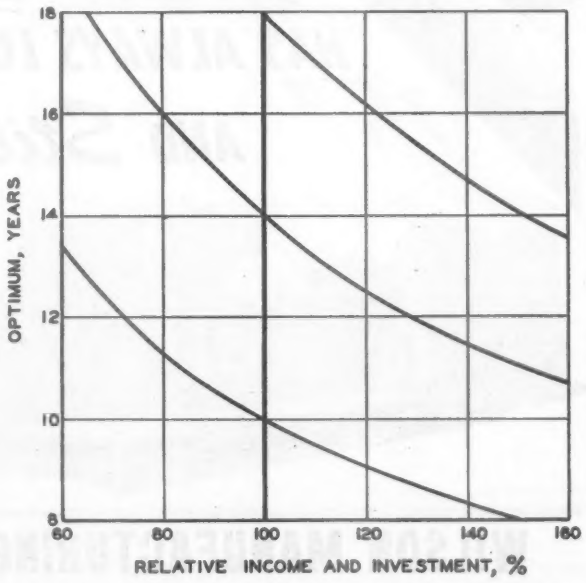

Fig. 21-5—The optimum life vs. the price of oil, condensate or natural gas; points on vertical line represent optimum life at current prices and the curves, at prospective prices. A curve applies only to the one point intersected on the vertical line

production is 6.9 per cent per year relative to the reserve producible at uniform rates or 4.83 per cent per year relative to the initial reserve. The optimum rate of production is 1,930,000 bbl. of condensate per year or 5,300 bbl. per day. This is also the optimum plant size for the product. The optimum plant size for the gas is 106,000,000 cu. ft. per day. The optimum number of producing wells is eleven. The total investment is 11(300,000) or 3,300,000 bbl. of condensate. The investment is 3.3/40 or 8.25 per cent of the initial condensate reserve. This program leaves 30 per cent or 12,000,000 bbl. of condensate to be recovered at declining rates of condensate production. The optimum rate of production based on 70 per cent of the initial reserve is not necessarily the optimum rate of production based on 100 per cent of the reserve.

A Natural-Gas Reservoir

Sixty per cent of a trillion-foot initial natural-gas reserve is producible at uniform rates. Estimate the optimum rate of production for the 600-billion-foot reserve producible at uniform rates if the conditions are as follows: The per well investment is 2 billion feet. The per well average producing capacity at the time production starts declining is 5.5 million feet per day. The peak demand during winter months is estimated at 22 per cent above the average demand. The burden on production is 30 per cent of gross.

Solution: In this example, the ratio X of annual per well producing capacity relative to the peak demand is defined by

$$X = 5.5(365)/1.22(2) = 0.822$$

The product X(1 — B) is given by

$$X(1 - B) = 0.822(1 - 0.3) = 0.575$$

From Fig. 21-2, the optimum rate of production is 8.2 per cent relative to the 600-billion-foot reserve or 4.9 per cent relative to the initial reserve. The optimum rate of production is 49 billion per year or 134 million cubic feet per day. The optimum number of wells relative to peak demand is 134(1.22)/5.5 or 30. The optimum investment is 30(2) or 60 billion feet of gas. The optimum investment is 6 per cent of the initial reserve or 10 per cent of the reserve producible at uniform rates. In this example 400 billion feet remain to be produced either at declining rates or at some uniform rate with the aid of a compressor plant. The optimum rate of production for 60 per cent of the initial reserve is not necessarily the optimum rate of production for 100 per cent of the reserve.

Optimum Life vs. Operating Outgo

Operating outgo, the burden B on gross production, is the sum of taxes, royalty and operating expenses. The curves in Fig. 21-3 show the effect of operating outgo on optimum life. Operating outgo is expressed in per cent of gross production. Annual per well rate of production at the time production starts declining is in M.c.f.'s per M.c.f., or barrels per barrel, invested per well. The optimum life increases with the burden on gross production. The trend in taxes on production and operating expenses is upward. As a consequence, the trend in the optimum rate of production is downward.

Optimum Life Per Well Producing Rate and Investment

Annual per well producing rates are here expressed in terms of per well investments. An annual per well production equal to one means that the annual production from a well is equal to the investment which a well represents. Accordingly, annual per well producing rates X are reciprocals, 1/X, of per well investments. Per well investment includes plant investment.

The curves in Fig. 21-4 show the effect of annual per well production and per well investment on the optimum life of the reserve producible at uniform rates of production. Four curves are included. The numbers 20, 40, 60, and 70 represent operating outgo in per cent of gross production. The optimum life decreases as annual per well production increases for a given per well investment. But the optimum life increases if the per well investment increases for a fixed per well annual rate of production. As the trend in per well investment is upward, the trend in the rate of production is downward.

Optimum Life vs. Price of Crude, Condensate, or Natural Gas

A change in the price of crude, condensate, or natural gas may influence per well investments and the income from production. The vertical line in Fig. 21-5 represents the optimum life at current prices. The curves represent optimum life at prospective prices for the points intersected on the vertical line. For example, a 14-year optimum would slide down to 10.7 years on the middle curve provided the increase in price per barrel, or per M.c.f., of reserve were sufficient. Other things equal, rising prices tend to increase the optimum rate of production. Declining prices tend to decrease the optimum rate of production.

Appendix to Article 21

At optimum rate of production the increase in present value dP with respect to the rate of production dQ is equal to zero, that is

$$\frac{dP}{dQ} = 0$$

Upon differentiating Equation 1, we obtain

$$\frac{dP}{dQ} = [Q(-Q^{-2}e^{-1/Q}) + \frac{1 - e^{-1/Q}}{i}][1 - B] - \frac{1}{X} = 0$$

which, when solved for X(1 — B), gives Equation 2.

Portable Laboratory Pumps

A SIMPLE manner by which portable pumps may be supplied for the chemical or analytical laboratory is to remove the small panels at the right end of columns Nos. 6 and 7, (Podbielniak units), leaving the Toepler pumps, etc., attached to the panel. This may be bolted to a wooden base, 22 in. square by 2 in. thick. Copper or Saran tubing connections are provided, with threaded fittings to connect the Toepler pump air valves with the air line at the various columns. A clever glassblower may install a mercury check valve just above the bulb of the pump, and a T-connection is inserted between the check valve and the stopcock. An open manometer is attached to the left side of the panel, with a check valve, the valve connected directly into the T-connection.

This improved Toepler pump will operate smoothly and easily and the possibility of a leak is reduced to the minimum. The manometer will facilitate the removal of cuts (fractions) without stopping the distillation, and it also offers better pump control. This suggestion was contributed by W. W. Hunt for use in the Baytown refinery of Humble Oil Co.

Edmund Borys, for 9 years with Standard Oil Co. of Texas, or its affiliates, is the new regional geologist for that company in Midland, Tex.

Dr. S. C. Ells has retired from the Canadian federal mines and resources department at Ottawa after long service as a geologist. Since 1913 Dr. Ells has been active in investigation of the tar sand deposits of northern Alberta.

Robert E. Trammell of Royalite Oil Co., Calgary, will leave soon for Colombia to join the staff of Tropical Oil Co. A veteran of the Turner Valley field, Trammell has been acting as chairman of the advisory board of the Alberta Petroleum Association.

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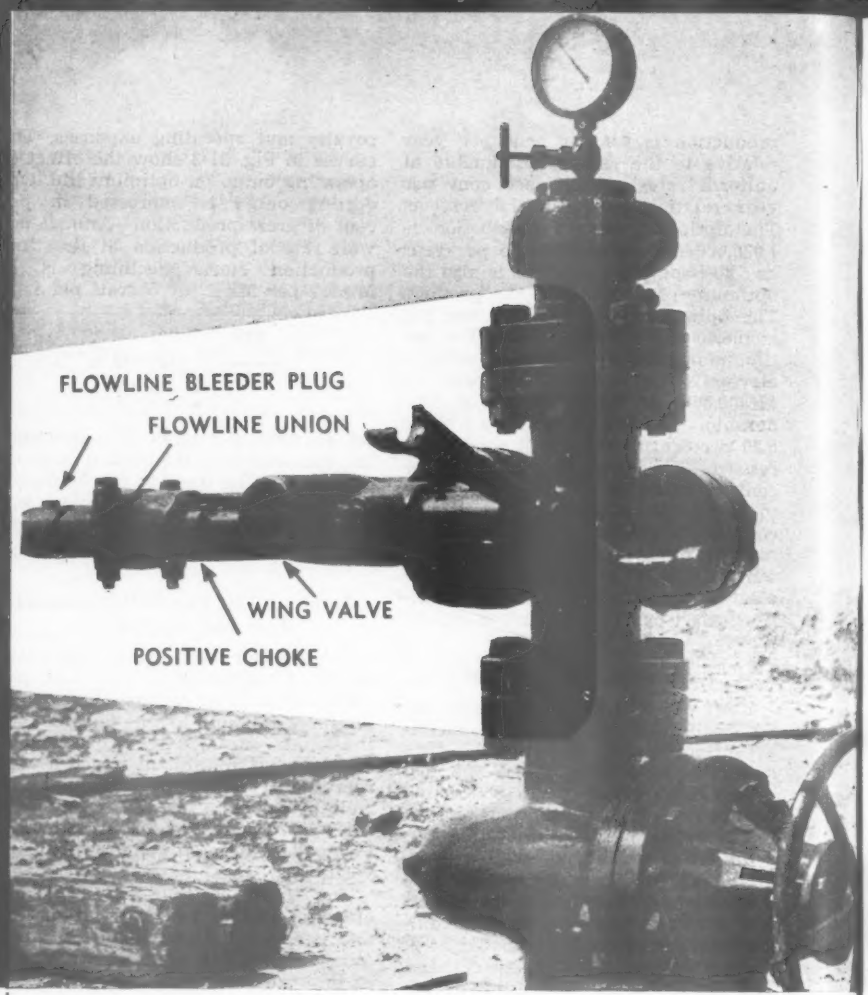

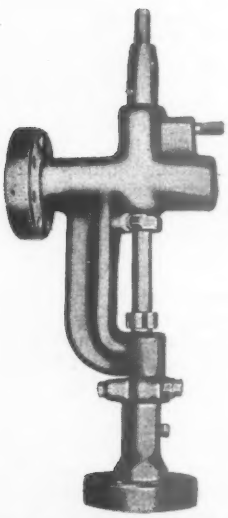

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CAMERON FLOW-WINGS

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

What Is Range Oil?

What is meant by the term range oil? Will most kerosenes do for range oil?—C. B. B.

Most kerosenes are suitable for use in cooking ranges or heating stoves, although special attention must be given to odor with an oil that will be used in cook stoves. One refiner supplies range oil of the following properties:

Gravity, A.P.I.	43.2
Odor	only trace (and sweet)
Doctor test	sweet
Corrosion	none
Color	25
Flash point, °F.	145
Burning test, 72 hours	good
End point, max., °F.	515

Economy in Topping Plants

In your Refiner's Notebook of November 24, you show curves of economical operation for through vaporizer temperatures. Why not put these into a single curve based on fraction of the vaporizer temperature?—C. A. R.

The question is good except that an attempt is made in the Refiner's Notebook to keep away from complicated relationships. One hundred per cent economy occurs if the stack temperature is about 290° F. above the exchanger outlet temperature and if the outlet temperature is about 40° F. below the vaporizer temperature. The relationship is too complicated to allow a single equation or chart, but the following tabulation based on a stack temperature of 800° F. indicates the general situation. "A" is defined as the exchanger-outlet temperature in terms of the percentage of the vaporizer temperature, all based on 70° F. as the crude temperature, whereas "B" is the economy of the topping plant:

A (per cent)	B (per cent)
10	21
20	24
30	27
40	30
50	33
60	38
70	46
80	63
90	87

Thus, for a vaporizer temperature of 470° F. and an exchanger-outlet temperature of 270° F., the economy is 33 per cent. In this example the exchanger-outlet temperature of 270° F. is halfway between 70° and 470° F. Note that an exchanger temperature of 0.8 (470 — 70) plus 70, or 390° F. must be attained before the economy of operation reaches even 63 per cent and that a temperature of 430° to 440° F. must be reached before most economical operation is attained.

Aniline Equivalent

Is the aniline equivalent like octane number in testing gasolines? We thought aniline caused a gasoline to knock.—G. M. C.

About 1931 General Motors Corp. (Lovell, Boyd & Campbell, Ind. Eng. Chem. 23, 26 and 555, 1931 and 25, 1,107, 1933) utilized "aniline equivalent" as a means of measuring the knock characteristics of a motor fuel. Aniline is a knock suppressor and in determining aniline equivalents it was used either by adding it to a standard reference fuel of 55-octane number, or by adding it to the unknown fuel in order to raise the quality of the unknown fuel up to the quality of the standard reference fuel. Thus, for high-octane-number fuels, aniline is added to the standard fuel to match the knock intensities, whereas with low-octane fuels it is necessary to add aniline to the unknown fuel to match the knock intensities. Adding aniline to the standard fuel gives positive aniline equivalents whereas adding aniline to the unknown fuel gives negative aniline equivalents. Further complication arises by the introduction of molecular weight. The following quotation illustrates the method:

"For example the aniline equivalent of isooctane, 2,2,4-trimethyl pentane (mol. wt. 114), is 16. This means that 114 g. of isootcane made up to a liter with gasoline of 55-octane number (about a 17 per cent solution of the hydrocarbon by volume) is equivalent in knock to a liter solution of aniline (mol. wt. 93) in gasoline containing 16/100 × 93 g. of aniline (about 1.5 per cent solution by volume). Similarly the aniline equivalent of —14 for n-heptane (mol. wt. 100) means that 100 g. of the heptane and 14/100 × 93 g. of aniline made up to a liter with the reference gasoline knock the same as the reference gasoline. This makes the solution contain about 15 per cent heptane and 1.3 per cent aniline by volume.

"The aniline equivalent of benzene is +10 and that of the standard gasoline containing 3.0 cc. of lead tetraethyl per gallon is also about +10."

Aniline equivalents have been useful in studying the relative knock intensities of hydrocarbons but have not found much application in the knock testing of gasolines.

Boiling-Point Gravity Constant

What is the boiling-point gravity constant and what is its importance? What are typical values for a Mid-Continent crude oil?—J. C. W.

The boiling-point gravity constant is a number which is distinctive for an oil or for each kind or base of oil, and it serves the same general purposes as the characterization factor, viscosity index, viscosity gravity constant, etc. (See The Oil and Gas Journal, Refiner's Notebook No. 20, December 2, 1944, page 91, entitled, "Comparison of Crude Oils") in classifying crude oils or oil stocks. It was presented by E. A. Jackson in the March 21, 1935, issue of The Oil and Gas Journal ("Boiling-Point Gravity Constant Is Index of Lube-Oil Characteristics"), and was developed because the current constants involved viscosity (Universal Saybolt) and hence could not be used for low-boiling nonviscous oils.

It involves the same factors, i.e., boiling point and gravity, as does characterization factor, but it has not been as widely adopted as the characterization factor. The constant B in the following equation is the boiling-point gravity constant:

$$G = B + (68 - 0.703B) \log T$$

in which

G = A.P.I. gravity at 60° F.
T = 50 per cent boiling point, °C.

High values of B indicate naphthenic oils whereas low values indicate paraffinic oils.

Typical values for several crude oils are:

	Boiling-point gravity constant	Characterization factor
Buckeye	172	12.33
Mid-Continent	180	11.98
Winkler	186	11.71
Spindletop	193	11.46

The boiling-point gravity constant seems to have gained more recognition in evaluating diesel fuel oils than in any other usage (see Detonation Characteristics of Diesel Fuels, Questions on Technology, page 42, October 21, 1941). W. F. Joachim (The Oil and Gas Journal, page 62, August 19, 1937) believes that the boiling-point gravity constant more accurately portrays the detonation characteristics of diesel fuels than any other index including even cetane numbers. The relationship among various diesel-fuel indexes are approximately:

Cetane No. (delay)	B.P. gravity number	Characterization factor	Diesel index
30	201.0	11.18	19
40	190.6	11.54	37
50	183.4	11.84	53
60	177.6	12.08	65
70	173.0	12.29	76

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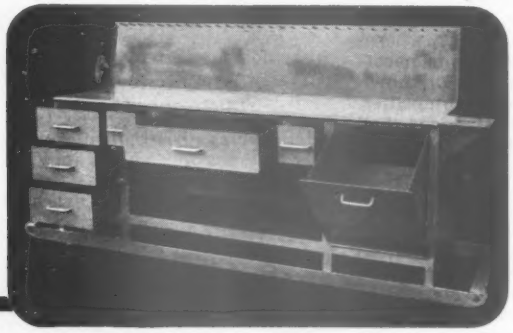

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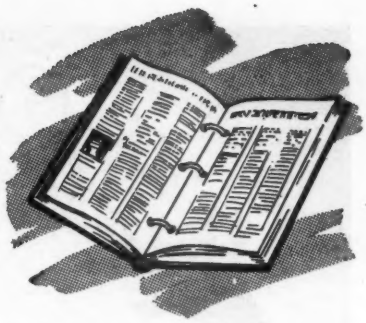
The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



Shell and Tube Passes in Exchangers

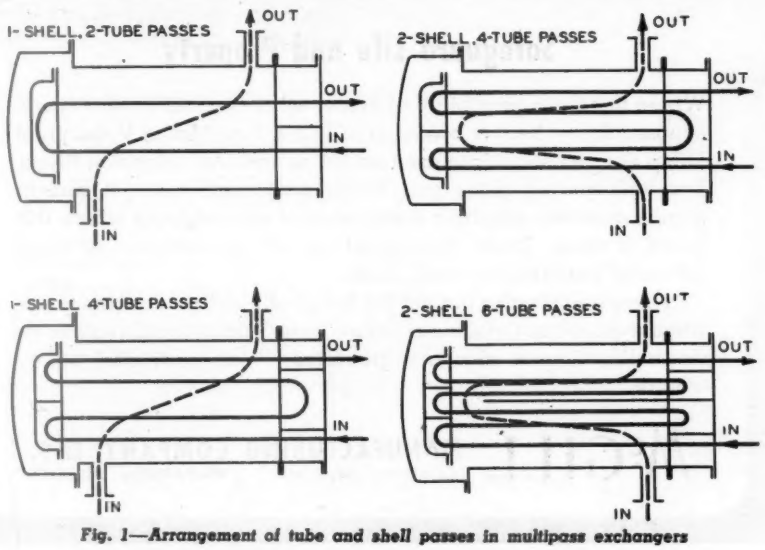


Fig. 1—Arrangement of tube and shell passes in multipass exchangers

BEWARE of exchangers in which either of the fluids flows in several passes because counter-current flow may not be attained and the efficiency will drop to very low values. This is true of all cases except the use of the same number of passes through the tubes and through the shell. Fig. 1 explains the meaning of "passes" and Table 1 shows factors by which the mean temperature difference of The Refiner's Notebooks 73 (December 22, 1945) or 75 (January 5, 1946) should be multiplied. The temperatures referred to in Table 1 have the following meaning, and their relationship is shown in Fig. 2:

T_1 = Inlet to shell, °F.
T_2 = Outlet shell, °F.
t_1 = Inlet to tubes, °F.
t_2 = Outlet tubes, °F.

Unfortunately, no simple means of correcting for failure to attain counter-current flow has been devised.

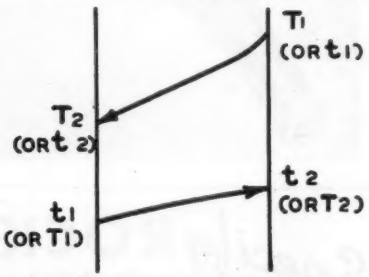


Fig. 2—Exchanger temperatures relationship

TABLE 1—CORRECTION FACTORS FOR LOG. MEAN TEMPERATURE DIFFERENCE IN MULTI-PASS HEAT EXCHANGERS

Single-pass shell with two or more tube passes

$\frac{t_2-t_1}{T_1-t_1}$	for these values of $\frac{T_1-T_2}{t_2-t_1}$									
	4	3	2.5	2	1.6	1.2	1.0	0.7	0.4	0.1
0.1	0.99	1.00								
0.125	0.92	.99	1.00	1.00						
0.15	0.95	.98	.99	.99	1.00					
0.175	0.91	.96	.97	.98	.99	1.00				
0.2	0.81	.94	.97	.97	.98	.99	1.00			
0.225		.88	.93	.96	.98	.98	.99			
0.25		.81	.90	.94	.96	.98	.99	1.00		
0.275		.50	.84	.92	.95	.97	.98	.99		
0.3			.73	.88	.93	.96	.97	.99		
0.325				.74	.91	.95	.96	.98		
0.35					.88	.93	.95	.97	1.00	
0.375					.83	.91	.94	.96	.99	
0.40					.77	.89	.92	.95	.99	
0.425					.65	.86	.90	.94	.98	
0.45						.81	.88	.93	.98	
0.475						.76	.84	.92	.97	
0.5						.67	.80	.90	.96	1.00
0.55							.66	.86	.94	.99
0.6								.78	.92	.99
0.65								.61	.88	.98
0.7									.82	.97
0.75									.71	.96
0.8									.48	.94
0.85										.91
0.9										.85
0.95										
(*)	.21	.27	.32	.37	.44	.52	.57	.67	.80	.94

PERFECT

EFFICIENCY ZERO

Two-pass shell with four or more tube passes

$\frac{t_2-t_1}{T_1-t_1}$	for these values of $\frac{T_1-T_2}{t_2-t_1}$									
	4	3	2.5	2	1.6	1.2	1.0	0.7	0.4	0.1
0.1	1.00									
0.125	.99	1.00								
0.15	.98	.99	1.00							
0.175	.96	.99	.99	1.00						
0.2	.90	.98	.99	.99	1.00					
0.225	.45	.96	.98	.99	.99					
0.25		.93	.96	.98	.99					
0.275		.84	.94	.97	.98	1.00				
0.3			.85	.96	.98	.99	1.00			
0.325			.64	.92	.96	.98	.99			
0.35				.88	.95	.98	.98	1.00		
0.375				.81	.93	.97	.98	.99		
0.40				.64	.91	.96	.98	.99		
0.425					.87	.95	.97	.99	1.00	
0.45					.81	.93	.96	.98	.99	
0.475					.64	.89	.93	.97	.99	
0.5						.81	.90	.93	.96	.98
0.55							.84	.89	.94	.97
0.6							.71	.84	.90	.94
0.65								.73	.84	.90
0.7									.73	.84
0.75										.73
0.8										
0.85										
0.9										
0.95										
(*)	.25	.32	.38	.45	.54	.66	.73	.84	.94	.99

PERFECT

EFFICIENCY ZERO

*Value of $\frac{t_2-t_1}{T_1-t_1}$ when correction factor (efficiency) is 0.50.

No. 77 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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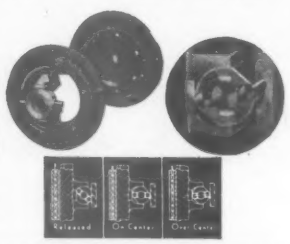

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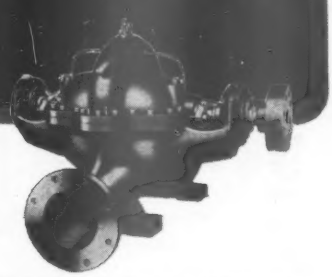
ROCKFORD CLUTCH (FORMERLY KNOWN AS DRILLING MACHINE) DIVISION BORG-WARNER CORPORATION
1305 Eighteenth Avenue, Rockford, Illinois, U. S. A.

ROCKFORD CLUTCHES

Continuous Duty
HORIZONTAL PUMPS
PRECISION-BUILT by PEERLESS



PEERLESS PUMPS

Peerless *(formerly Dayton-Dowd)* Horizontal Centrifugal split case or solid volute pumps, single and multi-stage are found wherever reliability, dependability and economical operating are desired. Engineered and manufactured with a view to long life, Peerless Horizontal Pumps are available for all classes of pumping requirements for high or low heads. The complete line of Peerless Deep Well Turbine, Hi-Lift, Hydro-Foil (propeller), Sewage, and Household pumps are standard for all Vertical pumping conditions.

The right pump for the right job. All inquiries and specifications processed by trained engineers.

PEERLESS PUMPS
PEERLESS PUMP DIVISION
Food Machinery Corp.

FACTORIES
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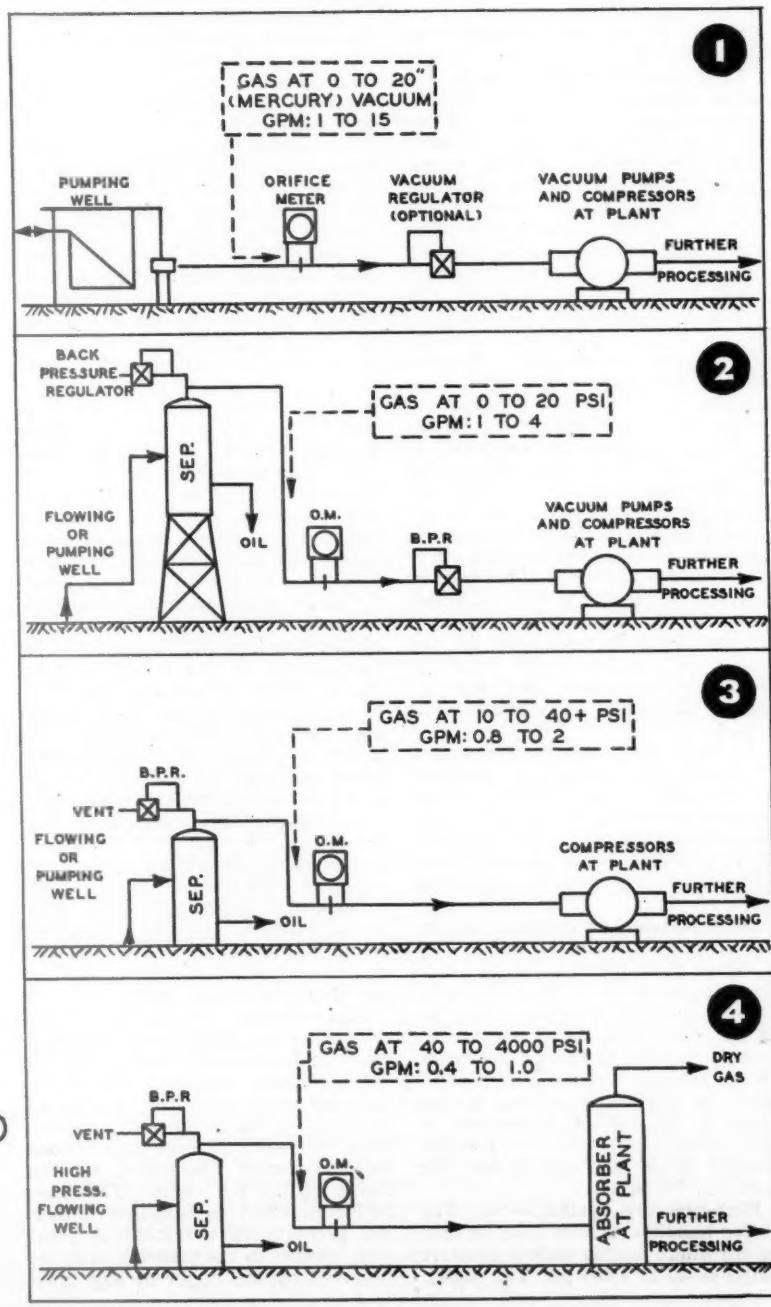
○ Engineering Fundamentals

No. 219

A FEATURE OF THE OIL AND GAS JOURNAL

Different Ways of Gathering Casinghead Gas



IN the previous article of this series (No. 218) the principal features of the casinghead-gas contract were presented and discussed. There are about four different basic ways of gathering casinghead gas, and in this article these will be described together with certain features of the casinghead-gas contract not included in the previous installment.

The contract on "takes." — The buyer agrees to purchase and "take" from seller **all** casinghead gas produced, except for certain stipulations included in the contract.

Unprofitable gas. — Buyer agrees to take **all** the gas testing more than (specified) g.p.m.; provided that during the period of flush casinghead-gas production from the property; the buyer is only obligated to take ratably as to quantity with all the other flush production connected to the gasoline plant. The seller has the right to dispose of any gas not taken or paid for by buyer, with the proviso that buyer can take any or all of such gas thereafter by giving the seller due notice of his election to do so.

If the casinghead gas from any wells or point of separation becomes insufficient in volume or gasoline content, or becomes unprofitable for the extraction of gasoline, buyer has the right to stop taking gas so long as such condition exists.

Vacuum. — This clause goes far

The Ranges of Pressures and Gasoline Contents Given Are Typical But Not Necessarily All-Inclusive

Fig. 1—Vacuum system. Used in stripper pools where the oil is pumped directly to stock tanks. A vacuum regulator may be installed to hold casinghead at atmospheric pressure or fixed minimum vacuum

Fig. 2—Low-pressure system. Separator operated at low pressure, and elevated to permit oil to dump to storage under gravity head. The gathering lines near plant may be at negative pressure (vacuum) conditions

Fig. 3—Medium-pressure system. With separator on ground, it must be operated at pressure sufficient to force the oil to storage. The greater the trap pressure, the less the gasoline content of the discharged gas

Fig. 4—High-pressure system. The gas may pass directly to absorber at plant. Two-stage separation and gathering is accomplished when the oil from the separator of Fig. 4 is discharged to the separator of Fig. 3

back to the early days of oil production and gasoline-plant operation when it was considered "good business" to pull relatively high vacuums on oil wells. The present contracts still retain the provision that the buyer will maintain on seller's wells a vacuum substantially equal to that maintained on offset wells by gasoline plants. However, by and large the pulling of vacuum on oil wells today is considered a detrimental oil production practice (illegal in many states, except for properties so operated before passage of the antivacuum laws), and the "vacuum clause" of contracts today is more to assure the satisfactory and complete gathering of casinghead gas rather than the actual pulling of vacuum directly on the producing wells themselves.

Different Systems for Gathering

Vacuum throughput system.—Typical arrangement is shown in Fig. 1. Principal feature is that gas-oil separators are not employed and the gathering lines connect directly to the casingheads of individual wells. Ordinarily, as mentioned under "Vacuum" above, it is not a desirable producing practice to pull vacuum on oil wells, but in many old pools the practice was started years ago. Without the inauguration of a repressuring program the vacuum pulling ordinarily cannot be discontinued without causing the oil production at the time to drop.

In cases where vacuum is pulled on oil wells, a greater vacuum usually will increase the current rate of production from the well (even though operating at atmospheric pressure together with repressuring may give more ultimate recovery in the long run). Accordingly, when conditions of gas gathering under vacuum are used in a field, it is customary for the seller's production men to check the vacuum of their lease-line wells against their offsets, to determine whether a greater vacuum is being pulled on the offset wells. This is done with a mercury-filled manometer. If such condition is found to prevail, the producer, under the contract, has the right to request the gasoline plant to pull substantially the same vacuum on his wells. It is obvious, however, that too precise or literal following of this course will only lead to the eventual pulling of extremely high vacuums on all wells in the field. A worth-while alternative, therefore, is for all of the oil producers in the area to agree that each will carry only a set or definite minimum pressure. This may be atmospheric pressure, 2-in. vacuum, 4-in. vacuum, etc.

A minimum pressure either can be maintained by installing a "pinch valve" in the gathering line and adjusting this in accordance with periodic pressure or vacuum tests at the casingheads, or the control may be maintained automatically by installing a vacuum regulator, as shown in Fig. 1.

Low-pressure system with elevated separators.—Typified by Fig. 2. The principal feature here is that all of the gathering system is under quite low pressure, in fact, in the lines nearest the gasoline plant gas may be at 2 to 10 in. (mercury) vacuum. At the farthest-distant producing properties, the pressure in the lines may be from atmospheric to about 20 psi.

The separator is elevated on stilts so that it may be operated at somewhere near atmospheric pressure. If the separator were placed at ground level, the low pressure at which it is operated would be insufficient to cause the crude oil to dump to the stock tanks. This is the reason, therefore, for elevating the separator, that is, to be able to operate it at substantially atmospheric pressure while permitting the oil to flow to storage by its natural or gravity head. With the separator operating at very low pressure, more of the light hydrocarbons in the crude will vaporize and pass out with the casinghead gas. For instance, the g.p.m. may range from 1 to 4.

In these low-pressure systems a back-pressure regulator is installed at the orifice-meter setting so that vacuum cannot be pulled on the separators and permitting the possibility of crude oil being entrained into or spilling over into the gathering lines.

Medium-pressure system, separator on ground.—Illustrated in Fig. 3. When the separator is placed on the ground level it must be operated at a pressure in the range between about 10 to 40 (or more) psi., or sufficient to discharge the crude oil to storage. Operating the separator at higher pressures retains more of the light hydrocarbons in the crude oil, hence the gasoline content of the gas will be less, for instance, 0.8 to 2.

High-pressure system.—See Fig. 4. Gas handled in such systems may be anywhere within such a pressure range as 40 to 4,000 psi. The higher the separation pressure, the lower will be the gasoline content; for example, in the range of 0.4 to 1.0 g.p.m. When higher gathering-line pressures are used it may not be necessary to have compressors at the gasoline plant, as the gas can flow directly into the absorber where the gasoline and light fractions will be absorbed in the mineral seal oil.

Two and three-stage separators.—Casinghead-gas-gathering systems may be in duplicate or triplicate, each operating at a different pressure. Figs. 4 and 3 may be combined to illustrate the functioning of two-stage separation and two gas-gathering systems. In this case the oil discharged from the separator of Fig. 4 will be the input stream to the separator of Fig. 3.

Choice of gas-oil separation conditions lies with seller.—The pressure at which the "wet," "green," or casinghead gas is to be separated from the crude oil is, of course, the choice of the owner of the producing property. On a typical lease, for example, the choice may lie between separating the gas and oil at medium pressure (Fig. 3), or using low-pressure separation (Fig. 2). It already has been pointed out that the lower the separation pressure, the richer will be the gasoline content or g.p.m. of the wet gas. A converse relation, however, will prevail as to the quality of the crude oil from the separation. That is, the higher the separator pressure, the higher will be the gravity of the crude oil from the separator. Consequently, it is up to the production men to determine the type of gas-oil separation to use which will bring in the highest **combined** revenues from the sale of the crude oil and of the casinghead gas. The engineering fundamentals that are involved with the separation processes of oil and gas will be the subject of later articles.

Drip.—The gasoline plant is obligated to keep its gathering lines reasonably clear of obstruction, and the buyer (plant) shall own all liquid collected in such lines.

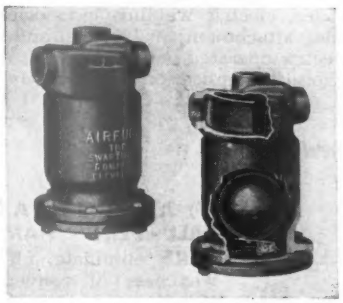
Right-of-way.—Buyer is granted the right to install and maintain lines and necessary equipment on seller's lease, including free entry in connection with the operations so long as these do not interfere with the seller's lease stipulations and producing operations, or the rights of the fee owner. The lines and equipment so installed remain the property of the gasoline plant and, subject to the contract, may be removed by the buyer at any time.

OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

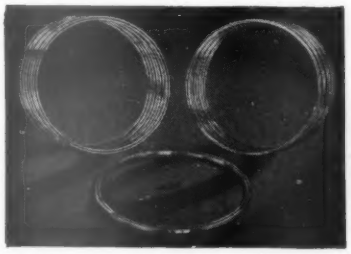
by Joe Cahill

(1) AIRFUGE, a new separator for removing moisture, oil, scale, etc., from compressed air, utilizes the centrifugal principle and features simplicity of construction and operation. Tests show air delivered is 99 per cent or more free of contamination. Air entering the inlet is diverted to the inner wall of the round body and unwanted substances whirl out of the air stream and drain to the bottom. The cleaned air may be taken off horizontally or vertically from pipe-tapped ports. Integral float-operated trap releases condensate automatically. Made of high-tensile iron; interior parts of corrosion-resisting materials. Bottom easily removed for cleaning. Made in three sizes for varying capacities and with a range of pipe-connection sizes. *The Swarthout Co.*



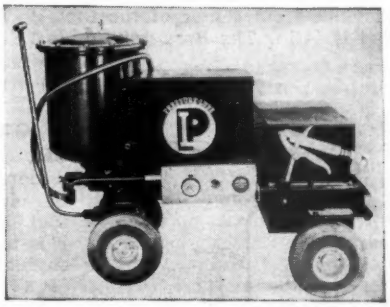
IT'S NEW CHECK IT

(2) EXTRA-THIN BEARINGS. To produce bearings only 0.750 in. wide, using ⅜-in. balls, and to manufacture these bearings with 30.500-in. i.d. and 32.000-in. o.d., is an achievement worthy of special mention. This bearing, of the angular contact design, takes the thrust load in one direction. Two bearings are mounted in opposed positions to take the thrust and radial loads. An extra-thin bearing of the four-point-contact design is only 0.750 in. wide, 0.750 in. wide, 31.000 in. i.d., 33.000 in o.d. Balls are used in each bearing. This bearing takes the thrust in either direction and only one bearing is required instead of two bearings of the angular contact type. Where minimum weight is essential, coupled with free movement and accuracy, this type of precision-made bearing has many peacetime applications. *Kaydon Engineering Corp.*



IT'S NEW CHECK IT

(3) NEW PORTABLE GREASING UNIT eliminates necessity for hand greasing and meets any lubricating requirement. Can be supplied with a grease gun for every purpose and either battery-powered or gasoline-driven motor. Completely portable—no electric cord or air hose required. Delivers up to 12,000 lb. steady pressure which is instantly available to clear the most obstinate channel stoppages. Eliminates the frequent trouble with frozen shackle fittings and other common problems. Provides "on the spot" lubrication—trucks, trailers, tractors, steam shovels, airplanes, rolling stock of all description may be serviced on the job without removing load. Compact design—saves valuable floor space and increases portability. *Pressurelube, Inc.*



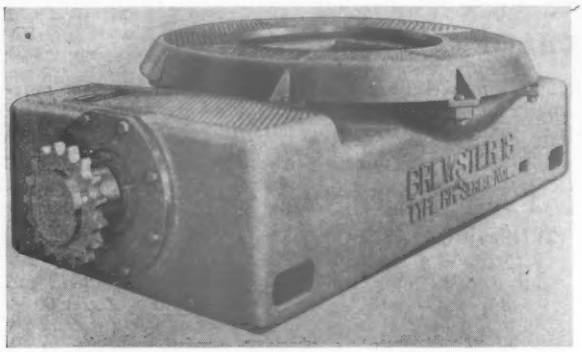
IT'S NEW CHECK IT

(4) HIGH SPEED 18-IN. ROTARY. Heavy-duty, high-speed 18-in. full table opening. Meets all drilling requirements to depths of 8,000 ft. Rated 167 tons at 0 r.p.m., rotates on an angular ball bearing containing twenty-five 2½-in. steel balls. This bearing rotates in an oil bath well protected by seals to keep the oil in and foreign matter out. Up thrust and radial loads absorbed by extra-large bronze bushing independently lubricated with grease. Bevel gears, also running in oil, transmit power to table. Gear ratio is 3.33 to 1. Double

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

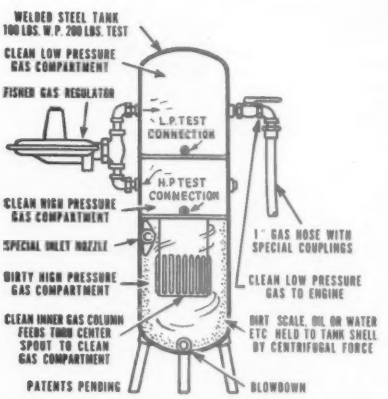
Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

row tapered roller bearings support the pinion shaft. Shaft, gears, and bearings are designed to take high-speed loads with minimum care and attention for the



life of the machine. Maximum rated table speed 400 r.p.m. Distance from center of the table to center line of sprocket is 44 in. *The Brewster Co., Inc.*

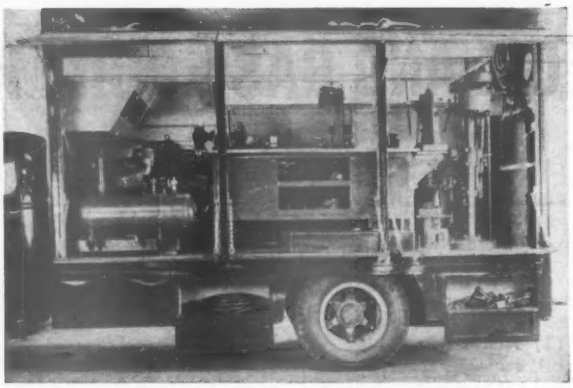
IT'S NEW CHECK IT


WELDED STEEL TANK
100 LBS. W.P. 200 LBS. TEST
CLEAN LOW PRESSURE GAS COMPARTMENT
FISHER GAS REGULATOR
L.P. TEST CONNECTION
H.P. TEST CONNECTION
CLEAN HIGH PRESSURE GAS COMPARTMENT
SPECIAL INLET NOZZLE
DIRTY HIGH PRESSURE GAS COMPARTMENT
CLEAN INNER GAS COLUMN FEEDS THRU CENTER SPOUT TO CLEAN GAS COMPARTMENT
PATENTS PENDING
1" GAS HOSE WITH SPECIAL COUPLINGS
CLEAN LOW PRESSURE GAS TO ENGINE
DIRT, SCALE, OIL OR WATER ETC. HELD TO TANK SHELL BY CENTRIFUGAL FORCE
BLOWDOWN

(5) GAS SCRUBBER of improved design completely cleans field fuel gas before it is used by the engines. Consists of a three-compartment tank with chambers that separate the foreign materials from the incoming field gas and deposit them in the bottom, where they are removed through a blow-off cock. The upper compartment stores clean gas at a low pressure, permitting a smooth even flow of gas into the carburetor. No screens, filter packs, or liquid sprays. Simple in design and requires only periodic blow downs while in use. Available in capacities to meet all requirements. *Shrimpton Equipment Co.*

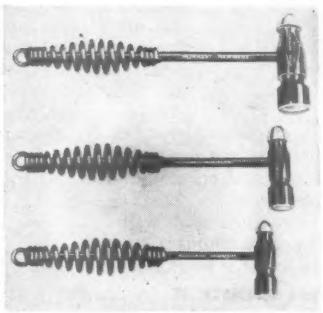
IT'S NEW CHECK IT

(6) COMPLETE TRUCK-MOUNTED REPAIR SHOP for use of contractors, utilities, oil companies, mines, railroads, street-railway systems, highway departments. Suitable for mounting on any standard long-wheel-base truck, the shop assembly contains virtually every item of equipment needed for mechanical repair and maintenance work. Eliminates costly practice of hauling broken-down machines to central shops for repairs. Assembly includes as its main units, a 60-cu.-ft. compressor, a 300-amp. welding generator, 5-kw. power generator, a 14-in. lathe (with complete lathe accessories and tools), and a drill press of 1-in. capacity. Auxiliary accessories include 30-



cu.-ft. acetylene generator; gas welding and cutting equipment; oxygen bottles; electric welding accessories; grinder with drill-grinder attachment; drill press, and a variety of pneumatic electric-operated hand tools. Assemblies can be made for specific applications. *Davey Compressor Co.*

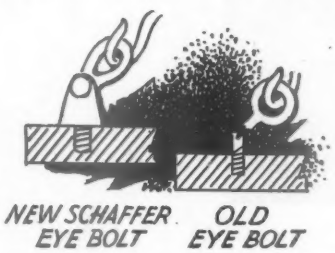
IT'S NEW CHECK IT



(7) ALL-METAL BALL-PEIN HAMMERS eliminate the weakness of conventional wood handles. Give greatly prolonged life, greater safety and dynamic balance. Heads are of alloy tool steel, flame hardened for toughness. Several models are now available in a variety of sizes. Unbreakable, can't burn or split and there are no wedges to come out. *Atlas Welding Accessories Co.*

IT'S NEW CHECK IT

(8) LOAD-CENTERING EYE BOLT, said to carry 100 times the load of the ordinary standard eye bolt, lifts in line with load. Prevents accidents and eliminates use of unnecessary chains. Made of high-grade steel, light in weight and precisely balanced, with replaceable bolts for extra-long life.



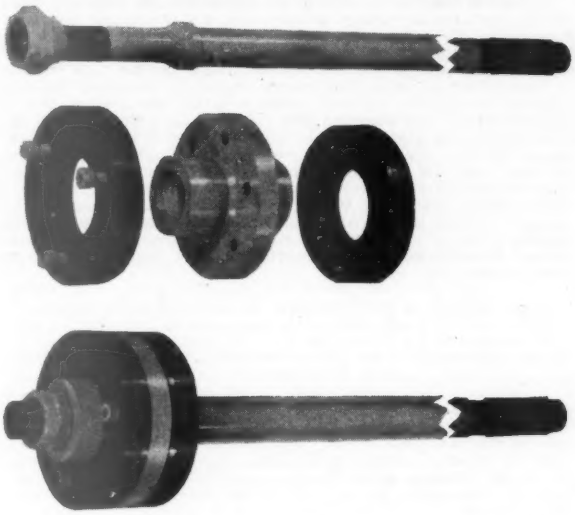
Size range: ¼ to 1½ in. U.S.S. & S.A.E. Special sizes made to order. *S. S. Schaffer & Co.*

IT'S NEW CHECK IT

(9) BORESCOPES, for internal measurement and inspection, are now furnished in single and multiple units up to 10 ft. in length. High-precision and necessary tools for visual inspection of internal work also furnished in right-angle model. *Polan Industries.*

IT'S NEW CHECK IT

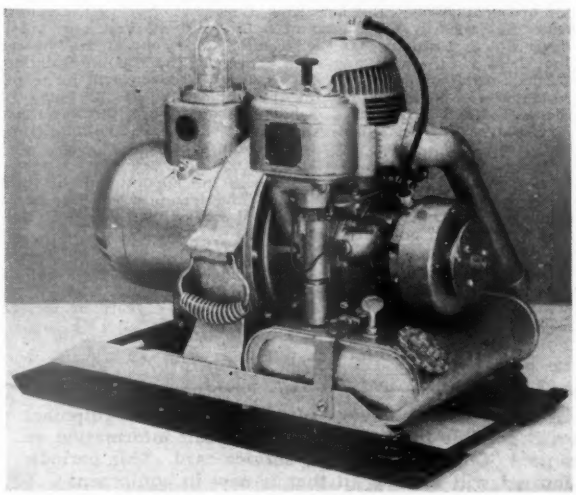
(10) NEW MUD-PUMP PISTON called "Wear-Ever Type R" designed for use at highest pressures under all operating conditions—pumping hot mud, oil laden drilling fluids, acids, etc.—consists of three parts, an alloy steel



body or hub, and two replaceable piston rubbers molded onto steel reinforcing plates. Rubbers are held to the central hub by three cap screws which compress the rubber gasket at back of reinforcing plate without distorting peripheral shape of rubber. Sizes from 3-in. to 9¼-in. diameter. *MacClatchie Manufacturing Co.*

IT'S NEW CHECK IT

(11) NEW LIGHTWEIGHT GENERATORS. Designed as a portable power source, these units can be moved quickly to any location or job. Extremely portable, the Model 21D, a 2,000-watt, 120-volt d.c. generator, weighs only 105 lb. and the Model 21A, an 1,800-watt, 115-volt a.c. generator, weighs only 115 lb. Both units have overall dimensions of 22⅜ by 17⅛ by 21⅛ in. The single-cylinder air-cooled two-cycle engine has only one valve, a rotary disk type which is self-seating and requires no adjustment. Engine speed is controlled by an automatic built-in governor. Pressure-vapor oil-system generator is direct connected to the engine. *Homelite Corp.*



IT'S NEW CHECK IT

OIL AND GAS EQUIPMENT Digest — IT'S NEW CHECK IT

TRADE LITERATURE

(12) STATIONARY POWER. New catalog, well printed and illustrated, shows applications of gasoline, gas, and diesel engines, and many stationary-installation pictures and specifications of the engines themselves are included. *Sterling Engine Co.*

IT'S NEW CHECK IT

(13) INSTRUCTION CARDS. A new series of instruction cards explaining the operation and maintenance of foam, soda acid, vaporizing liquid, and carbon dioxide fire extinguishers. Clear illustrations show the various steps to be taken in handling, operating, and maintaining the extinguishers. *American-La France-Foamite Corp.*

IT'S NEW CHECK IT

(14) WIRE-ROPE DATA FILE. Handy file folder containing wire-rope information which manufacturer will add to from time to time as new bulletins are issued. Good basic information on selection, use, and maintenance of wire rope. *Union Wire Rope Corp.*

IT'S NEW CHECK IT

(15) SPRAY NOZZLES. Sixteen-page bulletin on spray nozzles used for water cooling, air conditioning, and general industrial use. Charts of cooling capacities and construction suggestions for spray ponds are included. *Yarnall-Waring Co.*

IT'S NEW CHECK IT

(16) ALUMINUM COATING. Descriptive circular announcing one-coat aluminum treatment designed for metal surfaces exposed to excessive heat, moisture, chemical fumes and gases, or other corrosive agents. May be used on cement, tile, wood, and brick surfaces. A great many applications in the petroleum industry. *Reilly Tar & Chemical Corp.*

IT'S NEW CHECK IT

(17) SELECTION OF ARC-WELDING ELECTRODES. This catalog supplies complete data on proper electrodes to be used for all types of work on a wide variety of base metals, and describes the approved welding procedures for each application. Chemical analyses, specifications, and other engineering data are also supplied. *Wilson Welder & Metals Co.*

IT'S NEW CHECK IT

(18) CHROMATE CORROSION INHIBITORS. Twelve-page reprint covering tests which have been under observation for 5 years, including corrosion scores, weight loss, pitting, pH, and chromate consumption. Practical applications include air-conditioning systems, refrigeration brines, automobile systems, diesel engines, power rectifiers, and other recirculating and quiescent systems. *Mutual Chemical Co. of America.*

IT'S NEW CHECK IT

(19) SEALEDPOWER MOTORS. A four-page bulletin describes Sealedpower motor. An exclusive design developed for use in dusty locations, in places where there is excessive moisture, and for all applications where the conventional alternating-current, totally enclosed, fan-cooled motor has been used in the past. Available in sizes from 2 to 15 hp. Includes a cutaway view and pictures of six typical applications. Laboratory tests are illustrated and described. *Crocker-Wheeler Div. of Joshua Hendy Iron Works.*

IT'S NEW ✓ CHECK IT

(20) "LONG LIFE-EXPECTANCY" is the title of a new booklet which spotlights the long working life of diesel engines in terms of owner experience. The 16-page color publication provides, through a medium of word-and-picture stories, a representative cross-section of owners' engine experiences, gained and recorded under the conditions of everyday work in many fields. *Caterpillar Tractor Co.*

IT'S NEW ✓ CHECK IT

(21) REVIEW OF PLASTICS. New colorful pamphlet gives tables listing general properties of commonly used plastics, their uses and limitations, plus complete descriptions of each. *E. I. Du Pont De Nemours & Co.*

IT'S NEW ✓ CHECK IT

(22) NUCLEONICS. Eleven articles combined to make a special Nucleonics issue in this house organ, including such well-known authors as Dr. Arthur H. Compton, Maj. Gen. Leslie R. Groves, and Dr. George Gamow, bring a new aspect to this all-important subject. Cognizant of the universal appeal of the applications of nuclear energy, the editors have called upon outstanding scientists and men who made important contributions to the development of the atomic bomb to interpret some chapter in the birth of the atomic age. *Monsanto Chemical Co.*

IT'S NEW ✓ CHECK IT

(23) CRACKING CATALYSTS. Pilot-plant data, test results, and general information on the increasingly important subject of catalysts for petroleum cracking are well presented in this handy little booklet. Diagrammatical sketches and flow charts show the catalyst cracking processes. *American Cyanamid & Chemical Corp.*

IT'S NEW ✓ CHECK IT

(24) PUMPING ENGINEERING DATA. A 416-page handbook describes pumps of all types, principles of pump engineering, hydraulic data, pumping costs, electric motors, etc. This handbook is a complete engineering text which includes all phases of pumping from theory and engineering-data tables to the selection, operation, and maintenance of the motors and engines used in all operations. This is a handbook every engineer and operating man will be proud to have in his permanent library. *Economy Pumps, Inc.*

IT'S NEW ✓ CHECK IT

MEN IN THE NEWS

International Harvester Co. has announced the establishment of its first Pacific Coast motor-truck manufacturing plant at Emeryville, Calif., in the San Francisco Bay area. **Peter V. Moulder,** vice president in charge of the company's motor truck division, said the Emeryville Works would produce six models of heavy-duty International trucks, especially designed for the highway and off-the-highway needs of truck operators in the 11 western states. The company has entered into a 10-year lease on a manufacturing plant in Emeryville owned by Tide Water Associated Oil Co. The plant will employ initially between 250 and 300 men, and the company hopes to have some trucks on the assembly line in February for delivery late that month. Key personnel of the Emeryville Works are: **Adolph W. Engstrom,** works manager; **Robert Urich,** chief engineer; **F. C. Miller,** auditor; **E. H. Bickell,** material controller; **E. C. Becker,** buyer; **H. E. Straub,** general foreman; **H. W. Timm,** service engineer, and **A. S. Busselle,** parts manager.

Consolidation of two divisions of the organic chemicals department into a single unit under the name of Petroleum Chemicals Division is announced by E. I. du Pont de Nemours & Co. The merger combined the former alcohol and tetraethyl lead divisions, operating plants at Deepwater, N. J., and Baton Rouge, La. **J. L. Stecher,** who was manager of the tetraethyl lead division, was appointed division manager, while **William F. Krug, Jr.,** formerly manager of the alcohol division, was named assistant manager of the new unit. Other appointments include: **J. R. Sabina,** technical director; **Dr. J. M. Herndon,** division production manager; **E. M. Fanning,** assistant sales manager for petroleum chemicals. **G. T. Barnhill, Jr.,** will remain as sales director for alcohol and camphor.

The 200,000 hp. of driving force being turned out every month in the motor division of Westinghouse Electric Corp. at East Pittsburgh, Pa., is expected to soar to perhaps 300,000 hp. when operations reach full swing in the new plant at Buffalo, N. Y.

Robert C. Hood, who received his discharge in November from the U. S. Coast Guard, was elected secretary of Ansul Chemical Co., Marinette, Wis., at the firm's annual meeting of the board of directors. Other officers reelected were **H. V. Higley,** president; **F. J. Hood,** vice president; **J. F. Asell,** treasurer, and **Mrs. F. G. Hood,** mother of Robert C. and F. J. Hood, chairman of the board.

California Wire Cloth Corp., West Coast subsidiary of Colorado Fuel and Iron Corp., will manage sales and service operations of C.F.&I. on the Pacific Coast, according to **E. P. Holder,** president of C.F.&I. California Wire Cloth thus will direct the sales of all products of the following companies: Colorado Fuel and Iron Corp., Wickwire Spencer Steel Division, Wickwire Spencer Metallurgical Corp., Coburn Trolley Track Division, and American Wire Fabrics Corp. Territories served by the new sales setup will comprise Washington, Oregon, California, and Nevada.

Extension of the area of the Washington sales office of The Dow Chemical Co. to include Virginia, North and South Carolina, Georgia, and Florida has been announced by **Leland I. Doan,** vice president and director of sales.

Appointment of **William E. Mikolasy** as eastern sales representative of Stacey Brothers Gas Construction Co., Cincinnati, Ohio, has recently been announced by **A. E. Harvey,** vice president. Stacey Brothers Gas Construction Co. is one of the Dresser Industries which maintains sales offices in the Chanin Building, 122 East 42nd Street in New York, where Mikolasy will make his headquarters. Other appointments include **Walter E. Flagg** of Flagg, Brackett & Durgin, as sales representative in the New England states with headquarters in the Park Square Building, Boston, Mass.

Lone Star Cement Corp. announces the appointment of **Purd B. Wright, Jr.,** as manager, "Incor" and technical service; **Ernst Gruenwald** as chief engineer, technical service, and **James F. Callery** as manager, publicity department.

Maj. Van D. Bennett, who was employed by Bethlehem Supply Co. at Houston, Tex., before entering the United States Army, has returned to the States after spending 3½ years in foreign service.

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

Natural Gas

Panhandle Eastern Attacks Tri-State Gas Project

CHICAGO. — Federal Power Commission began taking testimony here this week in its consolidated hearing on a sharply controversial project involving estimated expenditure of around $90,000,000 and designed to supply Michigan, Wisconsin, and Iowa with natural gas. Michigan-Wisconsin Pipe Line Co. has applied for authority to construct a $70,000,000 line from Texas. Receiving hearings in connection with the project are applications of Natural Gas Pipe Line Co. of America. its affiliate, Texoma Natural Gas Co., and Chicago District Pipe Line Co. for authority to install additional facilities.

The hearing opened in Washington January 8, when Ira L. Letts, attorney for Panhandle Eastern Pipe Line Co., declared that organization would have to increase its rates if the Michigan-Wisconsin project was carried out.

The Chicago hearing was devoted to direct testimony and cross-examination concerning any emergency which may exist or is to be expected during the current winter and which may be alleviated by construction of less than the whole project involved in the applications of the four companies named.

At the Washington hearings, where only opening statements were made, Attorney Letts declared the gas market affected by the proposed new facilities "constitutes approximately 25 per cent of Panhandle's sales and income."

The project was described as a "needless duplication of existing facilities" that would supply "the entire market in the Detroit-Ann Arbor area in Michigan now being served by Panhandle.

Mississippi River Fuel Fails to Get Rehearing

WASHINGTON. — Federal Power Commission has denied a petition filed by Mississippi River Fuel Corp. for a rehearing on the commission's order of November 9, 1945, directing the company to reduce its wholesale rates for natural gas sold in interstate commerce to utility customers for resale for ultimate public consumption by not less than $945,613 a year or by about 27 per cent.

The commission's November 9 order allocates the company's costs between its regulated sales to utilities and nonregulated sales for industrial use only, fixes the fair rate of return for the company's regulated sales at 6 per cent, and establishes as reasonable a commodity rate of 13 cents per thousand cubic feet for firm gas sales to the utility customers, aggregate demand charges of $764,269 based on 1943 billing demands and 14 cents per thousand cubic feet for interruptible sales to utilities for resale.

Tennessee Natural to Build Line for Nashville Gas

WASHINGTON. — Tennessee Natural Gas Lines, Inc. has received from Federal Power Commission permission to construct 14 miles of 8⅝-in. pipe line from an interconnection with the main pipe line of Tennessee Gas & Transmission Co. near Westernia, Tenn., to a city gate interconnection with the facilities of Nashville Gas & Heating Co. The FPC order directs Tennessee Gas & Transmission Co. to establish the necessary connection for delivery of natural gas to meet Nashville's requirements.

The order states that by reason of the proposed ownership and operation of the stub line by a corporation other than Tennessee Gas & Transmission Co. or Nashville Gas & Heating Co. "the estimated cost of transportation of gas over a distance of approximately 14 miles would be excessive and would not constitute a reasonable element in the cost of such gas to the consumers of Nashville," and it conditions issuance of the certificate with the provision that "the rates and charges of applicant for sale of gas to Nashville Gas shall be approved in advance by this commission and shall not include costs other than are found to be just and reasonable."

Introduction of natural gas in Nashville, the order says, will result in a substantial rate reduction to consumers and assure continuity of an adequate supply.

The commission makes a finding that Nashville Gas & Heating Co. under its present franchise has authorization to sell and distribute natural gas in Nashville. The question of the distributing company's franchise authority was raised by coal, railroad, and labor interests as interveners. The order states that "according to the record, the Railroad and Public Utility Commission of the State of Tennessee takes the view that the Nashville Gas & Heating Co. is empowered under its franchise, among other things, to sell, distribute, and maintain a distribution system for the sale of natural and manufactured gas." The order also denies a motion of National Coal Association, United Mine Workers of America, and Order of Railway Conductors et al to dismiss the application for certificate.

Natural Gasoline

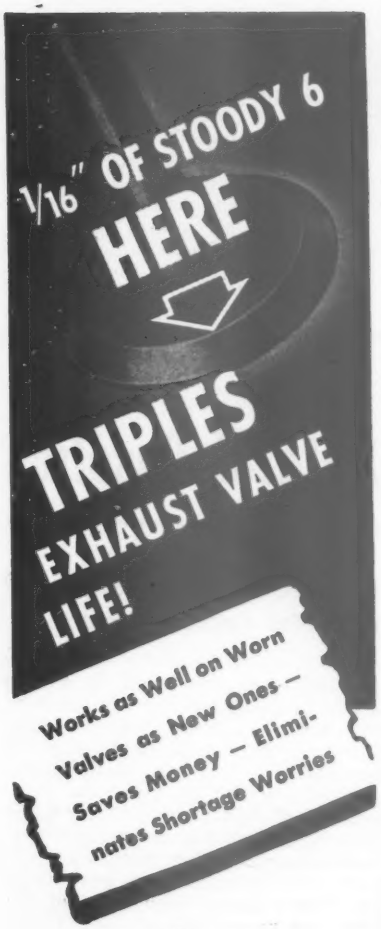
Engineering Skill Demanded By Cities Service Project

BARTLESVILLE, Okla.—Engineering skill was demanded in getting a new stabilizing tower into position for erection at the Tallant, Okla., gasoline plant of Cities Service Oil Co. (Del.) The tower, 30 in. in diameter, over 80 ft. high, and constructed of steel plate 11/16 in. thick, was moved into the plant, "sneaked" through complicated piping and column units and raised into position in less than 5 hours. Each move of the giant column from the time it entered the plant until it was bolted upright on its concrete base was carefully predetermined and timed to split-second accuracy.

The tower, containing 40 bubble trays, and equipped with a 34-in. by 16-ft. auxiliary reboiler, pumps, condensers, and interconnecting piping, will be automatically controlled with flow rate, temperature, and pressure controllers. The unit will have a capacity of 40,000 gal. of raw gasoline daily, with working pressure limits of 400 lb. per square inch. Sharply fractionated gasoline, free of propane and containing butane according to specifications as desired, will be produced with precision accuracy.

The company is installing also, at the Maud, Okla., chemical plant, a tile-packed absorption column 32 in. in diameter and 42 ft. high. This unit will be used to process further the "spent" process gas from the plant and remove unreacted hydrocarbons suitable for returning to the plant for conversion into chemicals.

The unit will increase the plant's production of raw formaldehyde, acetaldehyde, and methanol — which products are shipped to Tallant and refined to finished chemicals. It will include necessary exchangers, pumps, and coolers. A 150-hp. boiler is being installed to supply necessary steam.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REFINING

Catalysts, Yields, and Costs Discussed by W.P.R.A.

EL DORADO, Ark. — "Catalytic Cracking for the Medium and Small Refiners" was the principal subject of discussion at the first postwar technical meeting of Western Petroleum Refiners Association, held at the Garrett Hotel here January 18. A paper presented by Davis Reed, of Universal Oil Products Co., dealt with various types of catalysts, product yields, and operating costs. A working model of the company's new catalytic cracker, especially adaptable for the small refiner, was shown. General discussion followed presentation of the paper.

The association contemplates holding similar technical meetings at various places during 1946. Also it has arranged to devote two of the morning sessions of its thirty-fourth annual meeting, to be held in Fort Worth March 25-27, to technical discussions.

Gulf Coast Refiners Urge Removal of Ceilings

HOUSTON.—Removal of price ceilings on petroleum products is urged in a memorandum filed by Gulf Coast Refiners Association with Chester A. Bowles, price administrator. The same statement has been filed with Sen. Joseph C. O'Mahoney, chairman of the special Senate committee investigating petroleum resources, with the request that it become a part of the record of the coming hearings to be held by that committee relating to independent companies.

The memorandum, issued by the association's president, G. L. Rowsey, says independent petroleum refiners are confronted with a grave situation unless ceiling prices at the refinery level are removed promptly. The ceiling prices prevent normal flexibility of operations because refiners are forced to maintain high yields of products that can be sold to best advantage, without regard to demand or economical operation.

"Maintenance of fixed ceilings on petroleum products," says the memorandum, "thus forces refineries to operate with high gasoline yields and subsequent lower yields of middle distillates, such as kerosene and burning oils, and lower yields of residual fuel oils. Removal of ceilings at the refinery level need not necessarily exert marked effect on consumer prices, especially under decreased transportation rates, and such removal would certainly permit the refiners more flexible and economical operations."

Aviation-Fuel Demand Falls Sharply Since War

Impact of the war's cessation on the production of 100-octane gasoline is disclosed in its full perspective by the October report of the Bureau of Mines.

Production of 100-octane and above in October totaled 970,000 bbl., compared with 3,566,000 bbl. in September and 14,597,000 bbl. in October 1944, a decrease of 72.7 per cent from the preceding month and 93.3 cent from the same month a year earlier.

Meanwhile, demand for "other grades" of aviation gasoline decline 10.6 per cent from September figures as against a demand decline for 100 octane and above of 79.9 per cent.

Production of other grades of aviation gasoline was up to 1,831,000 bbl. in October, compared with 409,000 bbl. in September and 4,597,000 bbl. in October 1944.

Total demand for other finished grades of aviation gasoline at 721,000 bbl. was off only 10.6 per cent from September, and compared with demand of 3,585,000 bbl. in October 1944.

Domestic demand for all grades at 2,569,000 bbl. was off 73.4 per cent

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from the preceding month and compared with 10,906,000 bbl. in the year-earlier month.

Stocks of 100-octane and above aviation gasoline at the end of the month were 2,029,000 bbl., against 2,822,000 bbl. a month earlier and 5,076,000 bbl. a year earlier. Stocks of "other grades" were 3,385,000 bbl., against 3,691,000 bbl. a month earlier and 9,277,000 bbl. a year earlier, representing a 63.5 per cent stock decline in the 12-month period.

Catalytic Filter-Block Plant Put on Market by RFC

WASHINGTON.—The chemical plant for producing filter blocks for use as catalyst in making synthetic rubber and operated by Filtros, Inc., at East Rochester, N. Y., has been placed on the market for sale or lease by Reconstruction Finance Corp.

A single steel-frame, one-story concrete-block building, with 24,000 sq. ft. of floor space, occupies a site of about 2 acres. This structure contains four ceramic furnaces and assorted mixers, presses, platform scales and hand trucks. The plant in full operation had a monthly capacity of 75 tons of filter blocks.

General information can be obtained from any RFC regional office. Detailed data and engineering information are available at the New York office, 70 Pine Street.

Government Cuts Purchase Of Texas Motor Fuel

AUSTIN.—Gasoline purchases in Texas by the U. S. Government fell to 32,583,659 gal. in November, the lowest record in years, according to George H. Sheppard, comptroller. The peak was in April 1945, when Texas distributors sold 335,124,775 gal. to the Government to meet soaring Army and Navy needs. End of the war brought a sudden decline, and the tax-free sale to federal agencies dipped to 79,998,610 gal. in October.

Distribution to tax-paying civilians continues to increase. This total was 131,572,564 gal. in November, upon which distributors in December reported tax collections of $5,259,360. This is $1,057,159 more than the tax produced in November 1944, when civilians under rationing bought 103,241,404 gal. The state tax is 4 cents a gallon.

Bell Receives Navy Award For War Achievements

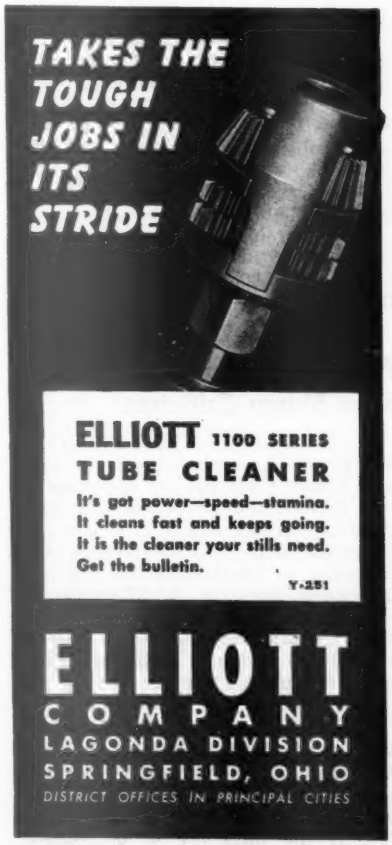
Bell Oil & Gas Co., Tulsa, has received under date of December 4, 1945, the Navy Certificate of Achievement "in recognition of exceptional accomplishment in behalf of the U.S. Navy and of meritorious contribution to the national war effort."

During the war Bell's refinery at Grandfield, Okla., and the facilities of Ben Franklin Refining Co., a subsidiary, at Admore, Okla., were engaged in the manufacture of petroleum products for the armed forces. These included aviation and all-purpose gasolines, and feed stocks for the 100-octane plant at Duncan, Okla., from which the services obtained superaviation fuel which played so important a part in the air superiority of the Allies.

What's This? Alligator Oil? Well! Well!

With a view of utilizing alligators infesting Brazil's rivers, industrialists of that country have found that a 50-50 blend of alligator oil and gasoline drives automobiles satisfactorily, according to the Brazilian Bulletin. Mixed 70-30 with combustible oil, the extract from alligator fat makes an illuminant, which is being used to light the streets of Tefe.

And a Swiss company is reported to have been successful in using an extract from alligator liver as a fixative for perfumes.



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To simplify ordering pipe coating and wrapping, Pipe Line Service Corporation offers you the easiest specifications you could ask for. You indicate either "Specification A" or "Specification B" together with the coating material desired and PLS does the rest. When you consider that you can get any type of protection you want, it's just good business to let Pipe Line Service assume the complete responsibility for the finished job.

SPECIFICATION "A"

INCLUDES
(1) Mechanical cleaning.
*(2) Mechanical priming with desired primer.
(3) Hot application of desired coating.
(4) Hot application of desired coating.
(5) One spiral wrapping of desired wrapping material.
(6) One spiral wrapping of heavy kraft paper.

SPECIFICATION "B"

INCLUDES
(1) Mechanical cleaning.
*(2) Mechanical priming with desired primer.
(3) Hot application of desired coating.
(4) Hot application of desired coating.
(5) One spiral wrapping of desired wrapping material.
(6) Hot application of desired coating.
(7) One spiral wrapping of heavy kraft paper.

PROTECTIVE COATING MATERIALS AVAILABLE ON ABOVE SPECIFICATIONS

Asphalts
Barrett Millwrap Enamel
Barrett Pipe Line Enamel
Barrett Waterworks Enamel
Bitumastic Regular Enamel
Bitumastic 70-B Enamel
Bitumastic XXH Enamel
Ennjay Enamel
*No-Ox-Id
Reilly Filled Pitch Enamel
Reilly No. 230 Enamel

*Primer not required with No-Ox-Id coatings.

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PIPE LINES

American-Owned Line Gets Right to Cross Palestine

NEW YORK.—Trans-Arabian Pipe Line Co., subsidiary of American Arabian Oil Co., has obtained a concession to construct a 1,000-mile oil pipe line across Palestine from Saudi Arabia to a Mediterranean port.

The concession, granted by Lt. Gen. Sir Alan Cunningham, Palestine high commissioner, provides that the pipe line company shall pay shipping dues of 2 pence (about 3½ cents) a ton for oil loaded outside the port and 5 cents for oil loaded in the port.

The contract was signed by William J. Lenahan for the pipe line company, which is jointly owned by Standard Oil Co. of California and The Texas Co. No details of the project were given.

Sanders Succeeds Rollins As Head of Gulf Lines

FORT WORTH. — R. C. Sanders, who helped in construction of the big-inch pipe line from Longview, Tex., to the East Coast and afterward served as superintendent of Florida Emergency Pipe Line, another government-owned project, has been made superintendent of the Fort Worth division of Gulf Refining Co., pipe-line department. He takes the place of W. F. Rollins, who retired after association with Gulf since 1906.

Sanders joined the company in 1920 as a draftsman at Houston in the mechanical engineering department. He was transferred to Fort Worth in 1926 and a year later was named assistant to Rollins.

Rollins was 19 when he got a job with J. M. Guffey Petroleum Co. (Gulf's predecessor) at Beaumont, in the Spindletop field. Promotions followed until, in 1919, he was assigned to Fort Worth as division superintendent of the pipe-line department.

Radio-Telephone Network Adopted by Pipe Line

SHREVEPORT. — United Gas Pipe Line Co. is using a two-way radiotelephone network for the operation of its 24-in. gas pipe line from Panola County, East Texas, to Sterlington, La. The network, first of its kind in the Southwest and approved by Federal Communications Commission, consists of three central stations, located in Shreveport and Sterlington, La., and Carthage, Tex. Forty-four portable mobile units are installed in service cars and trucks of the company.

The equipment, of the latest frequency modulation type, is designed to operate on two separate channels, for station-to-station use and the other for station-to-car and car-to-car transmission. The main transmitters at Shreveport and Sterling have a power output of 250 watts and the Carthage set 50 watts.

Gasoline Deliveries by Pipe Lines Are Growing

Despite a decline of nearly 2,000,000 bbl. in the volume of motor fuel transported by pipe lines in October, the 10-month record for 1945, reported last week by the Bureau of Mines, discloses constant growth in this method of moving gasoline.

Motor fuel turned into pipe lines in October totaled 15,411,000 bbl., compared with 17,593,000 bbl. in September and with 26,333,000 bbl. in October 1944. Deliveries by pipe lines during the month aggregated 17,877,000 bbl., compared with 18,491,000 bbl. delivered in September and with 26,565,000 bbl. in October 1944.

Gasoline deliveries by pipe lines in the first 10 months last year totaled 251,361,000 bbl., compared with 226,272,000 bbl. a year earlier.

SPA's Pipe-Line Policy Stirs Sharp Criticism

WASHINGTON. — The Surplus Property Administration's policy, now before Congress, for disposing of the Government's surplus oil pipe lines is stirring sharp criticism. Its statement that "first preference will be given to continuing the big and little-inch lines in petroleum service," was singled out for special comment. A summary of SPA's recommendations to Congress appears in the News Section of this issue.

"The income last year covered the cost of the entire life of the lines, with $138,000,000 profit," said Sen. William Langer. "It would be the height of absurdity to sell the lines when world conditions are so unsettled. If the lines are to be leased,

they should be leased to a national gas group syndicate."

Adhering to the stand the National Coal Association took before the O'Mahoney committee in December, J. D. Battle, the association's managing director, said the pipe lines should be kept inoperative for any emergency "that may arise requiring petroleum products in the East."

Spokesmen for the United Mine Workers of America said that converting the lines to natural-gas transportation "would be flirting with another Pearl Harbor."

Taking exception to statements of the coal group, John Ferguson, director of the Independent Natural Gas Association, said that protecting one type of industry against another is fundamentally wrong.

According to Reconstruction Finance Corp. officials, disposal will be keyed to SPA's report, and negotiations already carried on orally with prospective bidders will be eliminated when at variance with the recommendations.

FPC Postpones Hearing on Line From Carthage Field

WASHINGTON.—Federal Power Commission has postponed to April 15 its hearing on the application of Metropolitan Eastern Corp. for authority to construct an 825-mile, 18-in. natural-gas pipe line from the Carthage field in Panola County, Texas, northeast to a point near Hamilton, Ohio. Postponement to April 15 was requested by the company.

The proposed pipe line, with appurtenant facilities, including five compressor stations having an aggregate of 25,600 hp., and a dehydration plant, is estimated to cost $23,500,000. It would have an initial daily capacity of 140,000,000 cu. ft. of gas, to be sold to distributing companies.

Northern Natural to Build Meade County Line

MEADE, Kans.—Northern Natural Gas Co. will start construction of a 24-in. pipe line across Meade County about June 1, according to Al During, district manager. The new line, paralleling the present one, is to extend 84 miles from Old Springfield, in northern Seward County, to Mullinville, passing 9 miles north of Meade.

During said delivery of the pipe is expected to start soon and that the right-of-way had been acquired. The line will be used for moving more gas and will also be used for gas storage, if necessary.

Osburn and Troseth Go to Higher Pipe-Line Posts

HOUSTON.—E. R. Osburn, superintendent of The Texas-New Mexico Pipe Line Co. since organization in 1937, has been named assistant manager of that organization and of its affiliate, The Texas Pipe Line Co. His headquarters will be in Houston. He is succeeded in his former position by Ralph Troseth, also with the company since it started and its assistant superintendent for several years.

F. B. Whitaker, Jr., who recently returned to the company after military service, and R. W. Phillips have been made assistant superintendents. Phillips was with The Texas Pipe Line Co. for several years.

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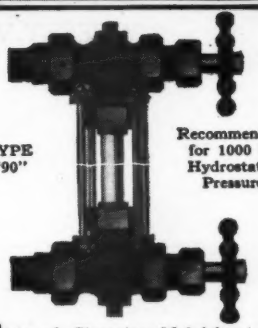

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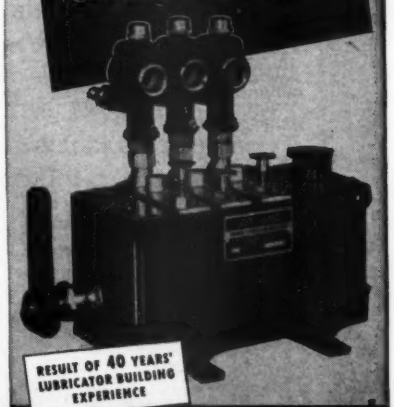

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LUBRICATOR DIVISION

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 12, 1946

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	27	14	0	*13	44,311	57	42	0	0	0	0	0	0	0	0	0	0
Pennsylvania	68	34	3	†31	109,376	141	110	0	0	0	0	0	0	0	0	0	0
West Virginia	14	0	11	3	41,160	18	16	0	0	0	0	0	0	0	0	0	0
Ohio	8	3	5	0	22,861	22	22	0	0	1	0	1	0	0	2	2	4
Indiana	11	7	1	3	22,005	13	6	0	0	0	0	0	0	0	0	0	0
Kentucky	8	6	0	2	14,806	18	14	0	0	0	1	1	0	0	0	2	2
Illinois	52	25	0	27	127,941	82	87	0	0	0	12	12	0	0	0	18	18
Michigan	6	3	0	3	15,378	21	32	0	0	0	0	0	0	0	0	3	3
Kansas	23	12	0	11	79,649	76	41	0	0	0	0	0	0	0	0	7	7
Neb., Mo., Iowa	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
Oklahoma	47	28	2	17	121,484	77	106	1	0	0	13	14	1	0	0	13	14
Texas	216	132	19	65	931,098	323	249	5	0	0	29	34	7	0	1	42	50
North Central	79	44	4	‡31	213,869	101	73	2	0	0	9	11	2	0	0	9	11
West	67	58	0	9	338,515	76	50	3	0	0	6	9	3	0	0	6	9
Panhandle	16	7	9	0	48,323	16	11	0	0	0	0	0	0	0	0	0	0
Eastern	16	6	6	4	102,832	27	13	0	0	0	3	3	0	0	0	5	5
Gulf Coast	31	16	0	15	203,141	83	76	0	0	0	6	6	1	0	0	16	17
Southwest	7	1	0	6	24,418	20	26	0	0	0	5	5	1	0	1	6	8
Louisiana	28	18	2	8	229,717	35	26	5	0	0	6	11	5	0	0	6	11
Northern	13	7	2	4	81,452	13	7	1	0	0	3	4	1	0	0	3	4
Southern	15	11	0	4	148,265	22	19	4	0	0	3	7	4	0	0	3	7
Arkansas	4	2	0	2	13,283	4	5	0	0	0	1	1	0	0	0	1	1
Mississippi	2	2	0	0	14,738	8	9	0	0	0	0	0	0	0	0	1	1
Southeastern States	2	0	0	2	18,830	3	1	0	0	0	2	2	0	0	0	3	3
Montana	7	3	1	3	15,130	13	8	0	0	0	0	0	0	0	0	0	0
Wyoming	2	0	1	1	9,905	6	9	0	0	1	0	1	0	0	2	1	3
Colorado	3	3	0	0	19,942	5	2	0	0	0	0	0	0	0	0	1	1
New Mexico	13	7	2	4	42,662	17	17	0	0	0	1	1	0	0	0	1	1
California	31	21	0	10	114,520	67	102	0	0	0	7	7	0	0	0	7	7
Total United States	572	320	47	205	2,008,796	1,006	910	11	0	2	72	85	13	0	5	108	126
Total previous week	434	246	44	144	1,518,197	434	416	2	0	3	36	41	2	0	3	36	41
Total Jan. 13, 1945	511	279	36	196	1,871,905	910	678	7	0	2	84	93	16	0	3	140	159

Service wells included: *13, †31, ‡1.

MARKET QUOTATIONS

(This service is abbreviated because most refinery products are selling at the Government's price ceilings. Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gal.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†	73-75
Mid-Continent*	6.375-6.75	5.625-6.00
Gulf Coast	6.75	5.750
Northeast Coast		9.875
California		6.50-7.00

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	28-70	18-55
Oklahoma (Group 3)	4.500	5.400
N. Texas (f.o.b. plant)	3.500	4.200
N. Louisiana (f.o.b. plant)	3.750	4.500
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.	
East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana, avg. grav.	1.20
Illinois Basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas	1.03

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$0.80	....	....	....
19-19.9	.84	....	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended January 5, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks—Gasoline	Distillate	Residual
East Coast	754	20,774	10,680	6,896
Appalachian	143	4,181	687	460
Ill., Ind., Ky.	728	20,183	5,174	2,680
Okla., Kan., Mo.	392	9,140	1,996	1,063
Inland Texas	214	2.854	385	737
Tex. Gulf Coast	1,162	17,022	5,889	5,233
La. Gulf Coast	316	4,967	1,858	1,379
North La., Ark.	50	1,924	453	281
Rocky Mtn.	105	2,001	452	755
California	787	15,448	7,625	22,887
Total 1- 5-46	4,651	98,494	35,199	42,371
Total 12-29-45	4,729	95,205	36,651	42,447
Total 1- 6-45	4,672	87,005	37,409	55,567

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
January 5, 1946	218,193,000
December 29, 1945	218,918,000
January 6, 1945	220,331,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Jan. 12 crude oil	Bureau of Mines demand forecast	Jan. 5 crude oil
Alabama	800	400	650
Arkansas	77,250	76,000	76,550
California	847,750	832,000	845,250
Colorado	21,550	20,000	21,000
Eastern	63,550	63,200	53,950
Florida	100	100	100
Illinois	205,800	206,100	202,900
Indiana	15,300	13,000	13,900
Kansas	240,200	260,000	205,950
Kentucky	29,950	28,500	30,200
Louisiana	367,500	365,000	373,050
North Louisiana	78,650	.....	77,750
South Louisiana	288,850	.....	295,300
Michigan	47,100	46,000	45,250
Mississippi	53,600	48,000	54,500
Montana	22,050	21,000	22,050
Nebraska	750	800	750
New Mexico	100,350	98,000	98,100
Oklahoma	391,050	382,000	392,800
Texas	2,000,800	1,950,000	1,999,300
East Texas	320,000	.....	320,000
East Central Texas	140,050	.....	139,800
North Central Texas	152,800	.....	152,800
Texas Panhandle	81,000	.....	81,000
West Texas	489,300	.....	489,400
Southwest Texas	328,900	.....	328,800
Texas Gulf Coast	488,750	.....	487,500
Wyoming	84,900	90,000	84,250
Total United States	4,579,350	4,500,000	4,520,500
Change from prev. week, up	58,850		

Total production January 1-January 12, 1946..... 63,698,950 bbl.
Same period last year ..... 56,375,700 bbl.

CRUDE-OIL STOCKS 218,193,000 bbl. as of Jan. 5—down 725,000 bbl. One year ago 220,331,000 bbl.

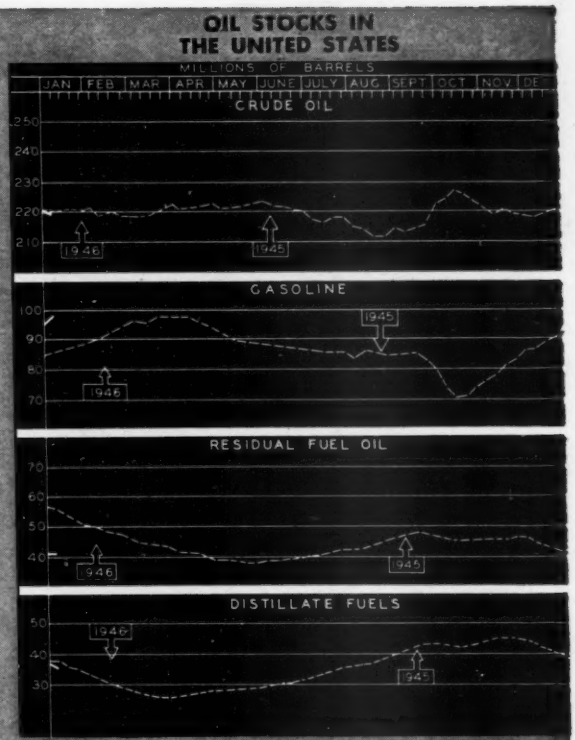
GASOLINE STOCKS 98,494,000 bbl. as of Jan. 5—up 3,289,000 bbl. One year ago 87,005,000 bbl.

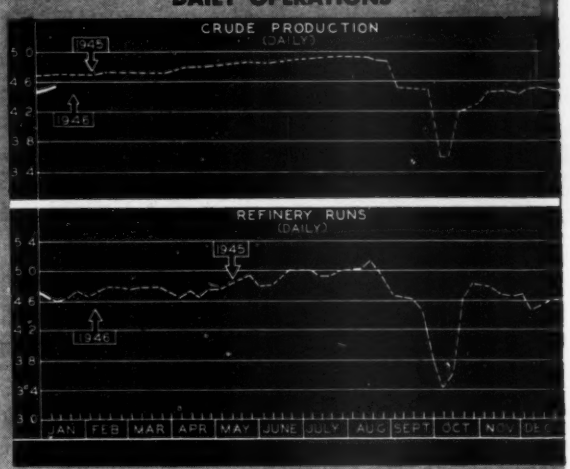
RESIDUAL FUEL-OIL STOCKS 42,371,000 bbl. as of Jan. 5—down 76,000 bbl. One year ago 55,567,000 bbl.

GAS OIL AND DISTILLATE STOCKS 35,199,000 bbl. as of Jan. 5—down 1,452,000 bbl. One year ago 37,409,000 bbl.

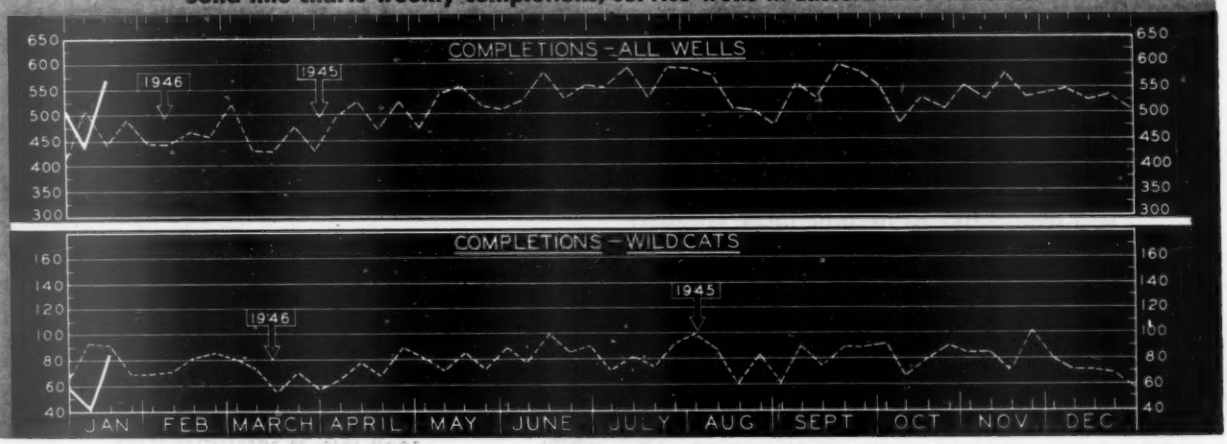
CRUDE-OIL PRODUCTION 4,579,350 bbl. as of Jan. 12—up 58,850 bbl. One year ago 4,718,600 bbl.

REFINERY RUNS 4,651,000 bbl. daily week ended Jan. 5—down 78,000 bbl. One year ago 4,672,000 bbl.





Solid line charts weekly completions, service wells in Eastern area included



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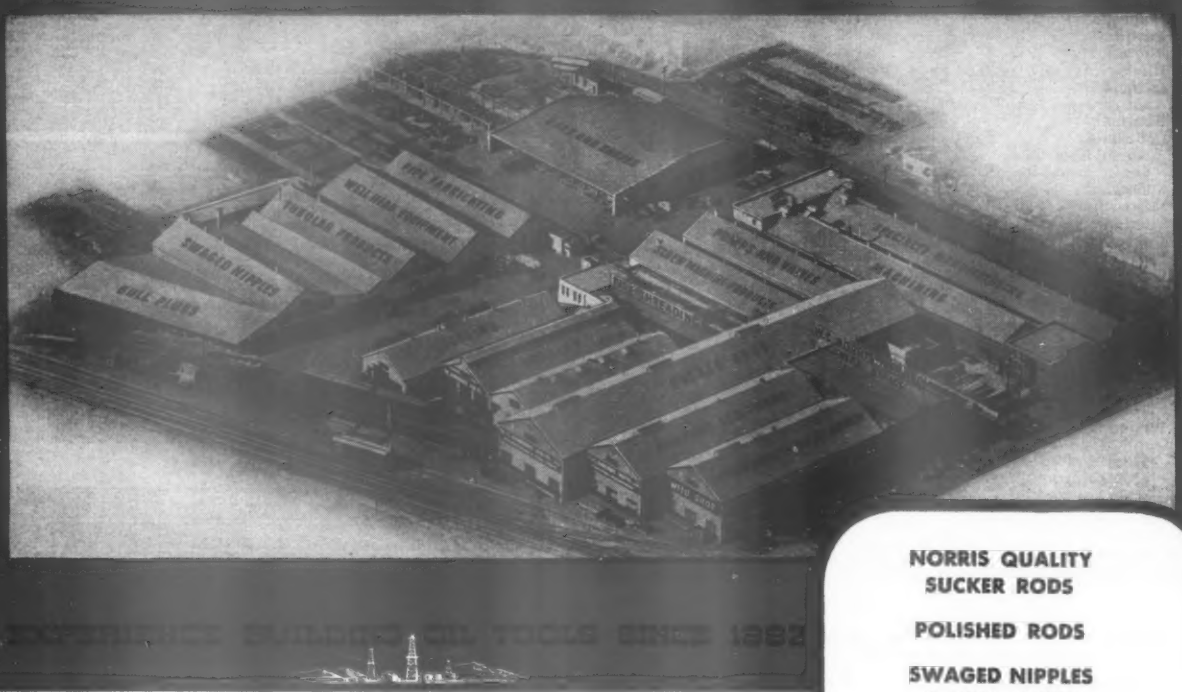

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Exploration and Drilling

Prospects for 1946 Are Confused

ALTHOUGH the 1946 drilling and exploration budgets of most companies have been adopted, it is difficult to determine what the over-all program of the whole industry will be. There is probably more tentativeness and probability of change in the present 1946 budgets than at any time in years.

Most forecasts about the postwar reconversion period have proved to be erroneous on timing, on both favorable and unfavorable factors outside the industry. Although production rates of cars, trucks, and tires have not come up to expectations, domestic civilian gasoline demand plus exports has increased and held up beyond expectations. The same holds true of fuel oils for industry and shipping.

This is important in the 1946 drilling program, because when the foundation work was done on the budgets last fall, these conditions were not anticipated. Even though some modifications were made in the final budget adoptions to allow for this, it is obvious that some of the basic premises have altered considerably. These changes will be allowed for in probable extensive modifications of the second-quarter drilling budget. It will therefore be extremely risky to forecast the entire 1946 trend on the basis of first-quarter trends.

Long-pull exploration policies have not changed, but have been reinforced by general acceptance of the fact that postwar demands for oil will be high and require built-up reserves to meet. However, the task is not regarded as either impossible or extremely difficult; the somewhat panicky exaggerations of wartime Washington are fading. This oil will be found, but right now it is more important to see to it that it is found at a reasonable cost than to indulge in day dreams of some new magic oil-finding tool, or speculation on how difficult it will be to find it at any cost.

Development drilling will continue with much sharper scrutiny of the probable payout. Swapping dollars in oil development and production to provide increased volume for pipeline and refining facilities will still be done occasionally, but such prospects will have a much harder time getting into approved drilling budgets.

Production and completion tables formerly appearing in this section of the Journal are now published with other statistical data. In this issue the statistical trend information is published on pages 116-117.

All things considered, it will probably be May or June before a definite trend in the 1946 drilling programs will be reasonably clear, particularly on exploration policies.

Important Developments

Rocky Mountain.—The important Rangely field in Northwest Colorado, near the Utah line, is getting increased pipe-line outlet, as Stanolind gradually builds up the pumping capacity and markets. Now running nearly 21,000 bbl. daily, of which about 15,000 bbl. is going to Utah Oil & Refining Co. at Salt Lake City, balance divided between Wasatch Oil Refining Co. at Salt Lake City and Idaho Refining Co. at Pocatello.

Pacific Western 5 Connaghan, SW SE 29-51-100, which looked like an important oil discovery in a Cambrian sand at Oregon Basin, turned out to be a failure and will be plugged back and completed in the Madison. Good shows of light green oil in the cores of this sand, which is known to be present over a substantial territory in Wyoming, had aroused great interest.

West Texas.—The Devonian added to its laurels as a first-class pre-Permian producer. Atlantic Refining Co. 1-G University, Section 30, Block 31, University, looked like the second Devonian producer in the Block 31 pool of east central Crane County. Magnolia Petroleum Co. 1-A Cowden, Section 7, Block A-55, PSL, west offset to the discovery well of the Dollar Hide pool, in Andrews County, was preparing to complete.

SOUTH LOUISIANA

Bon Air Field Opened in Jefferson Davis Parish

NEW ORLEANS.—The Bon Air field is a new pool opened by Sohio Petroleum Co. in the Iowa Junction area of Jefferson Davis Parish. The discovery well, 1 Claudius Fontenot et al, on potential test flowed 238 bbl. of 36° gravity oil in 24 hours through ⅛-in. choke with 1,375 lb. pressure on the tubing. Gas-oil ratio is 441 to 1. Drilled to a total depth of 11,000 ft., operators plugged back and set 5-in. liner at 9,743 ft. Production is through perforations made at 9,694-9,703. ft.

Magnolia Petroleum Co. 1 J. B. Morein, Mamou discovery well in Evangeline Parish, 5-5s-1e, made a 24-hour gage of 270 bbl. of 46° gravity oil through a ⅛-in. choke with 4,200 lb. flowing pressure on tubing. Gas-oil ratio now is 3,400 to 1, and no water cuts the flow. Production is through perforations made at 11,520-530 ft. Total depth 11,653 ft., with 7-in. casing set on bottom.

At Good Hope field, St. Charles Parish, Shell Oil Co., Inc., opened a new sand at 1 Blythe et al, Unit 2, and is also an east extension to production. Drilled to total depth of 9,396 ft., the well flowed 215 bbl. of 33° gravity oil daily through an 8/64-in. choke with 1,350 lb. pressure on the tubing. The 5½-in. casing was set at 9,390 ft., and perforated at 9,134-40 ft.

Union Oil Co. of California 1 Milliken & Farwell, prospective pool opener, in St. Charles Parish, on test from 8,776-85 ft., flowed at the rate of 166 bbl. of 33° gravity oil daily through a ⅛-in. choke on the drill stem, pressure 525 lb. Well is still cleaning showing a 5 per cent wash water cut. Total depth is 9,981 ft., with 5½-in. casing set at 8,897 ft.

In Beauregard Parish, Sun Oil Co., 1 Rice Land & Lumber Co., wildcat test in the Singer area, 32-4s-11w, is drilling below the 12,000-ft. level. It cored hard sand at 12,049 ft.

There were 10 new locations reported this week, 2 wildcats, 1 each in Evangeline and Washington parishes. Seven of the 15 completions are wildcats, two new pool openers and two new sands. The new pools are located one each in Iberia and Jefferson Davis parishes, and the new sands one each in Plaquemines and St. Charles parishes. The three dry wildcats are in Calcasieu, Cameron, and Iberia parishes. Plaquemines Parish led with four completions; Iberia was next with three.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Iberia Parish: New gas-condensate pool, Iberia field—Humble Oil & Refg. Co. 1 Mayo Romero, 2-12s-7e, top sand 11,010 ft., TD 11,330 ft., perf. 47 holes 11,010-15 ft., 5 bbl. condensate and 1,070,000 cu. ft. gas daily through 9/64-in. choke, TP 3,700 lb., gravity 51°, no water.

Jefferson Davis Parish: New oil pool, Bon Air field—Sohio Petroleum Co. 1 Claudius Fontenot et al, SW¼ 15-10s-6w, top sand 9,691 ft., TD 11,000 ft., PB 9,750 ft., perf. 54 holes 9,694-9,703 ft. 238 bbl. 24 hours through ⅛-in. choke, gas-oil ratio 441 to 1, TP 1,375 lb., gravity 36°, no water.

Plaquemines Parish: New oil sand Venice field—Tide Water Associated Oil Co. 28 Buras Levee District, 23-21s-30e, top sand 11,533 ft., TD 11,716 ft., perf. 54 holes 11,536-45 ft., 189 bbl. per day through ⅛-in. choke, gas-oil ratio 955 to 1, TP 1,875 lb., gravity 37°, 0.1 per cent water.

St. Charles Parish: New oil sand Good Hope field—Shell Oil Co., Inc., 1 Blythe et al Unit 2, 41-12s-8e, top sand 9,133 ft., TD 9,396 ft., perf. 21 holes 9,134-40 ft., 215 bbl. per day through ½-in. choke, gas-oil ratio 548 to 1, TP 1,350 lb., gravity 33°, no water.

SOUTH LOUISIANA WILDCAT FAILURES

Calcasieu Parish: Union Sulphur Co. Inc., 1 Krause & Managan, 2-10s-9w, dry at 9,199 ft.

Cameron Parish: Pure Oil Co. 1 Ira Hebert, 31-12s-7w, dry at 7,348 ft.

Iberia Parish: Union Oil Co. of Calif. 1 Delcambre, 4-14s-5e, approximately 5 mi. SW of Avery Island, dry at 12,536 ft.

ILLINOIS

Two New Producing Areas Opened in Clay County

MATTOON.—Two new oil pools were assured in Clay County during the past week with both discovery wells showing as excellent producers. The first of these is about 2½ miles southeast of production in the Kenner field and is the Deep Rock Oil Corp. 1 Ed Given, NW NW SE 4-2n-6e. The McClosky lime was encountered at 2,978-84 ft. and a 1-hour drill-stem test at 2,976-88 ft. recovered 1,500 ft. of clean oil, 100 ft. of oil-cut mud and no water. Casing has been set on the McClosky and operators were waiting on cement at the close of the week.

Clay County's second prospect was in the area 6½ miles northeast of Louisville, where N. V. Duncan 1 J. Leonard, SW SE NE 2-4n-7e, is being put on pump to test the Cypress sand at 2,560-76 ft. The 1 Leonard, originally drilled to 3,007 ft., was plugged back to 2,577 ft., where it swabbed 132 bbl. of oil in 8 hours immediately following a 60-qt. shot. It is about 3 miles from other oil-producing areas and is about midway between the Bible Grove East and Sailor Springs Consolidated fields.

The December drilling report of the Illinois State Geological Survey, just released, indicates that the Mattoon field of Coles County continues to be the center of oil drilling activity in the state. Twenty-six producing wells were reported as completed in this field during December, with 90 wells in various stages of drilling. This represents nearly one-half of the entire number of drilling wells in Illinois. The field is now approximately 8 miles long and 2 miles wide.

As a result of concentration of drilling in and around Mattoon, the number of discovery wells for the past month declined sharply. No new fields were discovered, but 3 extension wells were completed, 2 in the Mattoon field and 1 in the Clay City Consolidated field. In addition, one new pay horizon was uncovered during the month. It was the Paint Creek formation in the Samsville North field of Edwards County. This, however, is the same pay that was reported as the Bethel in the discovery well of the field.

Daily average production for Illinois increased from 205,000 bbl. in November to 208,000 bbl. in December. Total estimated production during December increased to 6,386,000 from 6,144,000 bbl. in November.

ILLINOIS WILDCAT FAILURES

Clay County: Nat. Assoc. Pet. 1 Williams, SW NE SE 33-5n-5e, dry at 2,655 ft., McClosky 2,614 ft.

Nu-Enamel 1 Utterback, SW SW NE 34-3n-7e, dry at 3,153 ft. McClosky 3,062 ft.

Clinton County: J. H. Fidler 1 Freund, NE SW NE 30-2n-1w, dry at 1,431 ft. Benoist 1,352 ft.

Coles County: T. L. Smith 1 Cole, SE NW SW 7-11n-7e, dry at 2,362 ft., Rosiclare 2,310 ft.

H. M. Gray 1 Dornblaser, NW SW SW 24-11n-7e, dry at 2,132 ft., Rosiclare 2,081 ft.

Edwards County: Fred Noah 1 Collyer, NE NE SW 20-2s-10e, dry at 3,350 ft., McClosky 3,328 ft.

Franklin County: Central P. L. et al 1 U. S. Coal & Coke, NE NE SE 11-6s-3e, dry at 2,656 ft., Paint Creek lime 2,652 ft.

Shelby County: Skelly 1 Chestman, SW SE NE 7-9n-3e, dry at 2,043 ft., St. Louis 2,025 ft.

W. W. Shaffer et al 1 Dappert, SW SW SW 2-9n-5e, dry at 2,232 ft., Fredonia 2,200 ft.

Wayne County: E. J. Davis 1 Winter, NE NE NW 26-2s-9e, dry at 3,377 ft., McClosky 3,350 ft.

J. J. Lynn 1 Smith, NW SW NE 21-1s-7e, dry at 3,325 ft., McClosky 3,258 ft.

White County: Tide Water 1 Donald, SW NW SW 14-5s-14w, dry at 3,068 ft., McClosky 2,984 ft.

OHIO, KENTUCKY

New Gas Field Opened In Ashland County

COLUMBUS.—A new gas pool in the Ashland-Lorain field was opened by Frank Lyons 1 Harold Hastings, Sec. 35, Jackson Township, Ashland County. Upper Clinton sand was found at 2,970-2,981 ft., and the well gaged 3,240,000 cu. ft. 24 hours after drilling in.

Hanley & Bird's deep test on Grant Pitts in Lot 93, Pittsfield Township, Lorain County, found the Trenton dry and 16,000 cu. ft. gas in the St. Petersburg sand, logged at 4,155-4,170 ft. Drilling is being continued.

The area surrounding the Clayton field in Perry County continues to be active. A number of small oil and gas pools have been discovered and prospects of additional small pools are good.

Mud and water in the fields have kept drilling to a minimum, and only 8 completions and 13 locations were reported with Lancaster field leading with 3 of each.

OHIO SUCCESSFUL WILDCAT

Ashland County, Jackson Township: Frank Lyons 1 Harold Hastings, Sec. 35, Clinton 2,970-2,981 ft., 3,240,000 cu. ft., TD 2,981 ft.

EASTERN KENTUCKY

ASHLAND.—High waters curtailed most operations in the Eastern Kentucky field during the week.

Several rigs and roads have been completed and one location was abandoned on the Green Howard property in Floyd County.

One oil completion was noted. R. H. Duff completed No. 3 on the D. B. Strong property, Sturgeon Creek, Jackson County, at a total depth of 1,025 ft., for 3 bbl.

WESTERN KENTUCKY

OWENSBORO. — Basin Drilling Co. is continuing to develop its recently discovered pool in Henderson County and apparently have a very good pool. The latest well in this area, 1 Ferrill, 8-P-23, swabbed 240 bbl. of oil daily before acid. Operators are now acidizing the McClosky lime at 2,442-48 ft. preparatory to completing the well. The 1 Ferrill is about ¾ mile south of the discovery well. Two other wells are under way in the area at the present time.

INDIANA

EVANSVILLE. — The North Owensville pool about 6 miles southwest of Princeton, Gibson County, is attracting considerable interest from the Indiana operators at the present time. The north limits of this pool continue to be extended by good wells in 19-2s-11w. Most wells are completed in the McClosky at about 2,260 ft. and average from 250 to 900 bbl. daily after acid treatment. The latest extension, Cherry & Kidd 1 Fannie Woodson, SE SW NW 19-2s-11w, is swabbing at the rate of 250 bbl. daily. Operators are preparing to acidize after perforating with 48 holes in the McClosky at 2,260-66 ft. Cherry & Kidd are also drilling at two offsets to this well.

Indiana completions showed a marked upward trend during the past week with 11 completions reported. These included seven oil wells, three dry holes, and one gas well.

TEXAS GULF COAST

Hardin County Test Opens New Deep Production

HOUSTON.—New deep production was assured on the South Flank of Ariola dome in Hardin County, when Houston Oil Co. of Texas and American Republics Corp. 18 fee was shut in for storage. Pipe was perforated at 7,485½-93½ ft. with 24 shots, and 2 minutes after the last shot was fired the well was flowing with 1,790 lb. pressure Total depth is 8,010 ft. and the 5½-in. casing set at 7,549 ft. Operators have run 3½-in. production packer and are preparing to make a production flow test. This well is 3,200 ft. from nearest production.

In the Bon Wier area of Newton County, Humble Oil & Refining Co. 1 W. W. Moore, Jr., wildcat, 2¼ miles southwest of Bon Wier townsite in A. D. Stark Survey, flowed wash water, gas and condensate by heads through 18 perforations at 13,028-30 ft., but packer gave way before the well was cleaned. Operators did not reset packer, but squeezed perforations for additional tests.

Magnolia Petroleum Co. 2 Bolton, wildcat 3 miles west of Glendale, Henry Bond League, Abstract 75, in Trinity County, made a drill-stem test through 96 perforations at 10,500-520 ft. and flowed 11 bbl. of condensate, and an unestimated amount of gas in 16 hours with 2,200 lb. working pressure. Perforations have been squeezed, and cement is being drilled out to make another test. Perforations will be made at 10,550-560 ft. in Edwards lime for the second test, after which tests will be made at even lower levels before making any production trys.

Also, in Trinty County, Magnolia 1 Oscar Gibson, wildcat test in the C. Sanchez Survey, Abstract 39, continues to drill ahead in chalk below 7,424 ft.

Northeast outpost at Altair field, Colorado County, Superior Oil Co. 4-A Mrs. Matilda Tait, Patrick O'Daugherty Survey, made an initial gage of 383 bbl. of high-gravity oil daily along with 87,700 cu. ft. of gas, through a 12/64-in. choke with 1,420 lb. pressure on the tubing. Sands showing gas and condensate were topped at 8,242 ft., and pipe was perforated with 66 shots from 8,242-58 ft. for the completion. Total depth is 8,340 ft., and 7-in. casing is cemented on bottom. Superior is installing draw works and doing preliminary operations on their southwest outpost test, 2-A Mrs. Myra S. Pryor. It is 1,810 ft. southwest of the 1-A.

Phillips Petroleum Co. 1 Mrs. Ola McCann Unit, 10 wildcat, in W. Smith Survey, Abstract 243, 6 miles east of Gregory in San Patricio County, recovered 150 ft. of oil-cut mud, slightly brackish, on drill-stem test at 6,609-16 ft., and recovered 90 ft. of oil-cut mud with 720 ft. of salt water from 6,609-35 ft. Operators are coring ahead below 7,750 ft.

The Texas Co. 120-C Pierce Estates, link test between Lane City field and the Withers field of Wharton County, just across

the Colorado River from Lane City and about ½ mile east of Withers production, in Wm. Pettus League, has been shut in for storage. The well was drilled to a depth of 5,390 ft., then set 5½-in. casing at 5,382 ft. After the setting, hole was cored to 5,420 ft. in sand and well evidently started flowing and had to be shut in. Texas Co. has staked location for the 121-C Pierce Estates, just 933 ft. west of the 120-C, in Wm. Pettus League. Operations are scheduled to start immediately. It will be drilled to a maximum of 6,500 ft.

Humble has located a 7,500-ft. test on the north flank of the Humble field. It is 1 Foster Lumber Co., on a 400-acre lease in the E. Votaw Survey, Abstract 823, and operations are to start immediately.

All of the 13 new locations reported this week are in proven areas, with Chambers, Fort Bend and Jackson counties receiving 2 each. There were 14 completions, 7 producers and 7 dry holes. Two of the dry holes are wildcats, one each in Fort Bend and Jackson counties. Brazoria, Jackson, and Jefferson counties received the greatest activity with two completions each.

UPPER GULF COAST WILDCAT FAILURES

Fort Bend County: H. E. Williams and Wm. S. Thompson 1 Mrs. R. L. Young, Edward Robertson Sur., dry at 6,525 ft.

Jackson County: Donald Moore and T. J. Ahern 1 J. A. Leissner, Valentine Garcia Sur., 1 mi. W of LaSalle, dry at 7,505 ft.

EASTERN TEXAS

Smackover to Be Tested in Bowie County Wildcat

DALLAS.—Barnsdall Oil Co. will drill a Smackover lime wildcat in Bowie County 4 miles southwest of Texarkana. It is 1 Pickering in the R. E. Sevey Survey. It is scheduled to drill to 7,500 ft. The new test is 3 miles northeast of Eylau Smackover pool.

Magnolia Petroleum Co. 2 Bolton, Henry Bond Survey, Trinity County wildcat 3 miles east of Glendale, squeezed off holes from 10,500-520 ft. where it had shown for a possible condensate discovery in the Edwards lime, and will test from 10,550-560 ft. American Liberty Oil Co. 1 Houston County Timber Co., Henry Survey, another Trinity County wildcat, was waiting orders at 8,145 ft. with no shows reported.

Fred M. Manning, Inc., 1 Houston County Timber Co., Mirando Survey, 4 miles southeast of Weches, Houston County, ran a drill-stem test from 6,030-38 ft., with the packer developing a slow leak, and recovery was 1,320 ft. of mud and 620 ft. of salt water. A core at this depth recovered sand with some oil. With elevation at 310 ft., Woodbine was topped at 6,030 ft.

Barney Carter 1 F. E. Hill, H. Sheppard Survey, 1½ miles northwest of Fairfield, Freestone County, was reported to have flowed an estimated 12,000,000 cu. ft. of gas daily. Production is through perforations from 4,175-85 ft. in the Woodbine sand. Delta Drilling Co. 1 Livingston, Nacogdoches University Survey, wildcat 3 miles southeast of Reilly Springs, southern Hopkins County, was preparing to perforate for completion attempt at 8,015 ft. in the Rodessa Glen Rose zone where a good gas-condensate showing was encountered.

Carthage field, Panola County, reported five completions and Hawkins field, Wood County, and Sand Flat field, Smith County two each. Most active drilling is in the Carthage district where 40 wells are under way. Hawkins field has 16 drilling wells, and Pickton field, Hopkins County 7. Hawkins field has three locations and Pickton has two.

EASTERN TEXAS WILDCAT FAILURES

Henderson County: Bobby Manziel 1 T. R.

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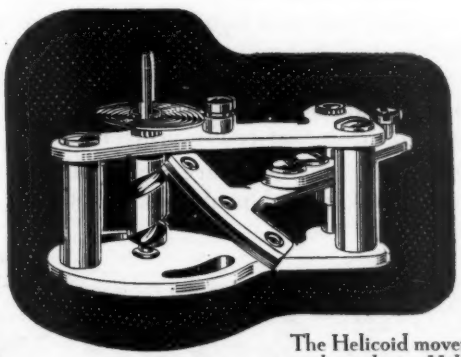

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Chitty, Jose Rodriquez Morales Sur., 6 mi. W Eustace, elev. 452 ft., Woodbine 3,598 ft., dry, TD 3,660 ft.

Houston County: H. L. Hunt 1 Houston County Timber Co., Wm. Conner Sur., 6 mi. E Ratliff, elev. 338 ft., Woodbine 7,090 ft., Buda 7,492 ft., dry, TD 8,194 ft.

San Augustine County: M. E. Davis 1 C. Thomas, Wm. B. Horn Sur. A-142, 10 mi. W San Augustine, elev. 405 ft., Glen Rose 6,535 ft., James 7,920 ft., dry, TD 9,274 ft.

N. CENTRAL TEXAS

Lime Oil Showing Hit in Montague Wildcat

WICHITA FALLS.—Continental Oil Co. 1 Jarrell, Block 3433, TE&L Survey, southwestern Montague County, wildcat 5 miles south of Bowie, drilled lime with a slight show of oil from 7,080-85 ft. It was drilled to 7,095 ft. A 1-hour drill-stem test was run from 7,050-95 ft., and 2,400 ft. of salt water and 60 ft. of drilling fluid with no shows of oil or gas were recovered. Seven-inch casing has been set at 6,806 ft. Four miles north and slightly east of this test, the company will drill 1 Mrs. S. B. Harvey. It is a 7,200-ft. Ellenburger test, 1,400 ft. from the south and east lines of Section 2880, TE&L Survey, Abstract 798. American Trading & Production Co. 1 S. L. Henry, N. Kimbro Survey, on the north end of the Hildreth field, Montague County, is considered dry after drill-stem test from 6,018-45 ft. recovered 4,500 ft. of salt water with 3,000 lb. bottom-hole pressure in 10 minutes. This section had logged conglomerate with a slight show of oil and gas.

Magnolia Petroleum Co. has staked location for a 6,500-ft. wildcat in Foard County. It is 1 Steele, 990 ft. from the south line and 330 ft. from the west line of Section 307, Block A, H&TC Survey, 7 miles southeast of Carroll. Another 6,500-ft. wildcat to test the Ellenburger will be drilled by the Cities Service Oil Co. in Knox County where location has been made for 1 Doris Mulkey, 660 ft. from the north and west lines of Section 163, Block 44, H&TC Survey, 2 miles south of Truscott.

Standard Oil Co. of Texas 3 Beasley, J. McKerley Survey, ½ mile northwest of Sivells Bend, Cooke County, took a 15-minute drill-stem test from 5,825-34 ft. and recovered 1,560 ft. of oil and 60 ft. of brackish water. It was coring ahead.

Holliday pool, Archer County, reported six completions this week, Madden field, Wichita County, and Gatewood field, Cooke County each reported five new wells and Electra, Wichita County, four. Cooper field, Archer County, has nine drilling wells, National pool, Wilbarger County, eight, Hildreth pool, Montague County, and Sivells Bend field, Cooke County, each has seven. Young County had six new field locations, Archer County and Jack County each received four.

In West Central Texas, Santa Anna field, Coleman County, Jones County Regular field, Stephens County Regular field each reported two completions this week. Stephens County Regular field has eight drilling wells, Reddin field, Taylor County, four and Cisco field, Eastland County, three. Coleman County Regular field, Reddin field and Cook field, Shackelford County, each had one new location.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCATS

Clay County: New oil pool—Continental 1-C Heard, Sec. 3222, TE&L Survey, 3 mi. SE Joy, elev. 1,151 ft., flowed 1,168 bbl. day through ½-in. choke, perf. 6,468-96 ft. Ellenburger, gravity 41°, gas-oil ratio 650, TD 6,496 ft.

Cooke County: New oil pay—James L. An-

derson 1 C. T. Mooney, A. C. C. Bailey Sur. A-44, ½ mi. SW Wilson 2,300-ft. pool, pumped 211 bbl. day, perf. 3,933-43 ft. Strawn, gravity 31°, TD 3,943 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Bell Oil & Gas 1 C. L. Abercrombie, Sec. 157, J. W. Harris Subd., 2½ mi. W and 1½ mi. S Archer City, elev. 1,006 ft., dry, TD 2,097 ft.

Fain-McGaha and Geo. W. Strake 2 O'Donohoe, Sec. 95, Lot 4, ATNCL Sur., 6 mi. S and 3 mi. E Mankins, elev. 1,066 ft., dry, TD 3,987 ft.

Cooke County: Norwood & Wood 1 W. F. Soloman, SPRR Sur. A-976, 4 mi. W and 5 mi. N Muenster, elev. 1,173 ft., dry, TD 3,006 ft.

Wichita County: R. G. Drilling 4 Henry Krohn, Blk. 226, Waggoner Colony Subd., 2½ mi. N Electra, dry, TD 2,060 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Coleman County: Mohawk Drilling 1 J. C. Brown, ETRR Sur. No. 108, 1 mi. S Talpa, elev. 1,917 ft., dry in Caddo, TD 3,669 ft.

Jones County: S. D. Johnson et al 1 S. J. Omans, Sec. 20, Blk. 3, H&TC Sur., 5 mi. NE Avoca, Palo Pinto 3,268 ft., dry, TD 3,275 ft.

Palo Pinto County: Dunn-Powell-Kirby 1 Sikes, Sec. 1709, TE&L Sur., 2 mi. W Grayford, dry, TD 1,765 ft.

Shackelford County: James Blair Baker 1 Mrs. Dell Newell, Sec. 6, Blk. 12, T&P Sur., 3 mi. SE Budmathews, elev. 1,866 ft., dry in Cook, TD 1,712 ft.

Taylor County: Prince Bros. & Gehle 1 Will Parmelly, Wm. B. Hardin Sur. No. 130, 4 mi. S Tye, Swastika 2,690 ft., dry, TD 2,760 ft.

APPALACHIAN FIELD

Fayette County Gets Large Devonian Gas Well

PITTSBURGH.—In southwest Pennsylvania, Manufacturers Light & Heat Co. completed a large lower Devonian gas well in No. 6 Barton on Chestnut Ridge in Georges Township, Fayette County. With the Onondaga chert topped at 7,172 ft., about 450,000 cu. ft. of gas was being carried from pays at 7,218-32 ft. and 7,260-65 ft. when at 7,275 ft. the flow increased to 7,000,000 cu. ft. and was turned into the lines. This is the largest volume from any well in lower pool and appeared about 40 ft. higher on structure than any of the others.

In Fairfield Township Westmoreland County, Peoples Natural Gas Co. topped the Tully lime at 6,332 ft., in the wildcat on Camilla Giffin farm which appears to be running regionally normal after two failures on that closure. It places the Tully at minus 4,685 ft.

In West Virginia, two good Oriskany gas wells were completed in Ravenswood district, Jackson County. United Fuel Gas Co. completed 5,738 Miriam Hersman for 5,959,000 cu. ft. gas final open flow with a rock pressure of 1,425 lbs. The Corniferous lime was placed at 4,864 ft.; Oriskany 4,960-93 ft.; gas 4,966-72 ft. and 4,976-80 ft. Columbian Carbon Co. completed 825 G. S. Barnhart for 5,034,000 cu. ft. gas with the Corniferous lime 4,757 ft.; Oriskany 4,860 ft.; gas 4,865-86 ft.; rock pressure 1,465 lb. in 60 hours. Neither well was shot.

In Mingo County, United Fuel Gas Co. completed 5,409 Central Trust Co. in Harvey district, for 2,929,000 cu. ft. gas from the Maxton sand, total depth 1,286 ft.

In Upshur County, Cumberland & Allegheny Gas Co. completed No. 405 H. H. Long with a final gage of 1,947,000 cu. ft. gas from the Fourth sand, total depth 2,272 ft.

In Clay district, Harrison County, Hope Natural Gas Co. completed 9,001 C. C. Wilson with a gage of 800,000 cu. ft. gas from the Fifty Foot sand, total depth 1,863 ft.

In Braxton County, Hope Natural Gas Co. topped the Corniferous chert at 6,112 ft. in the important Oriskany wildcat on the Ed L. Boggs lease in Otter district. It starts at an elevation of 1,154 ft.

No new locations were listed in southwest Pennsylvania. In West Virginia, nine new locations were announced in Elk district, Barbour County; Ravenswood district, Jackson County; Laurel Hill district, Lincoln County; Browns Creek district, McDowell County; Geary district, Roane County; and Baileysville district, Wyoming County.

ROCKY MOUNTAIN

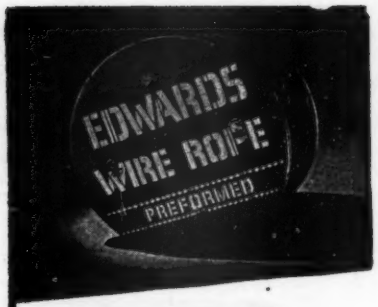
Crude Runs From Rangely Field Establish Record

DENVER.—Crude oil pipe line runs from the Rangely field, western Colorado, averaged 20,753 bbl. daily in the week ending January 5, not only a record for that field, but for any field in the state. The runs were equal to an average of 546 bbl. per well for the 38 wells in the field. The increase is due to the policy of Stanolind in gradually building up the runs to its pipe line capacity. The runs are scheduled to include 15,000 bbl. daily for the Utah Oil Refining Co. at Salt Lake City, and 5,000 bbl. daily for the Wasatch Oil Refining Co. at Salt Lake City and the Idaho Refining Co. at Pocatello.

Improved black oil market.—Several black oil fields in Wyoming which were closed down with the ending of the war have resumed production as a result of an increased demand for fuel oil for the Navy. The fields include Circle Ridge, Maverick Springs and others in Fremont County. The Husky Refining Co. refinery at Riverton, which had large naval contracts during the war, and which shut down with the cessation of hostilities, has resumed operation.

South Elk Basin.—Continental Oil Co. has completed its 3 Ida Goodstein, SW NE SW 20-57n-99w, South Elk Basin field, for 5,900,000 cu. ft. of gas per day in the Dakota through 24 holes in the casing at 5,462-72 ft. This is the first well completed in the upper sands as these were cased off in the Tensleep sand oil discovery last spring. It was drilled as a test of the Dakota and Morrison sands. The casing was perforated opposite the Morrison at 5,660-97 and 5,730-53 ft. with 144 shots, but that horizon showed for only 230,000 cu. ft. While drilling to the objectives, the second Frontier was tested through 177 holes at 4,387-4,443 ft., and made 3,760,000 cu. ft., after which that horizon was cemented off. Only two wells to the Tensleep have been completed, 1 Ida Goodstein, the discovery, which pumped 594 bbl. in 24 hours, but subsequently showed a small increase, and 2 Northern Pacific, ¼ mile to the south. One well is drilling. The South Elk Basin Unit comprises 7,044 acres, but leases extend over a much larger area. Husky Refining Co. reported this week that it had closed leases on 12,000 acres south of the Unit, of which 7,000 acres were acquired from the E. R. Palmer and 5,000 acres from the Taggart livestock interests. It plans to drill some exploratory wells this year. Between the Husky acreage and the south boundary of the Unit, Stanolind Oil & Gas Co. has a large block.

Cat Creek Ellis sand extended.—Continental Oil Co. 10 Brown, SE SE SE 17-15n-30e, Cat Creek field, in Montana, flowed 100 bbl. of clean pipe-line oil in 16½ hours from the Ellis sand through perforations with 93 shots at 1,403-21 ft. This is the most northwesterly well on the northwest-southeast trend of producers completed in the Ellis and is approximately a mile north-



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west of Spencer & Livingston 5-A O'Dea, the most southeasterly well. The Brown well was the first completed through perforated casing, the others setting the pipe on top of the sand. The O'Dea well, which came in flowing 50 bbl. an hour, is still making 1,000 bbl. per day.

Oregon Basin test disappointing.—Pacific Western 5 Connaghan, SW SE 29-51-100, Oregon Basin, which for several weeks has held out hopes for a discovery in a sand in the Cambrian, perforated and tested two more zones without results, recovering no oil, gas or water. It will plug back and test the Madison. Few shows in recent years in this area have caused as much interest among oil men as those in this well. Good shows of free light green oil in the cores were seen by numerous scouts.

New operations.—Eighteen new operations were reported for the first week of the new year, of which 4 were in Colorado, 3 at Rangely and 1 at Wilson Creek; 3 were in Wyoming, one each at Rock River and Garland, and one wildcat to the gas sand near the recent Zimmerman Butte discovery in the Embar; 9 were in Montana, of which 4 were in Cat Creek, 2 in Kevin-Sunburst, 2 in Cut Bank and 1 in the Cedar Creek gas field; Northwest New Mexico 2, 1 at Barker Creek, and a wildcat in the Fulcher Basin area.

Completions.—Fourteen wells were completed, of which 6 were oil wells with initial production of 1,098 bbl.; 4 were gas wells and 4 were dry holes. The oil wells included two in the Rangely field and one at Wilson Creek in Colorado with initial production of 796 bbl.; one in Cat Creek and two in Cut Bank in Montana with initial production of 302 bbl. Gas wells included one at South Elk Basin and one in the Cedar Creek field in Wyoming and Montana, and one each in Fulcher Basin and Barker Creek in northwest New Mexico.

WYOMING SUCCESSFUL WILDCAT

South Elk Basin, Park County: Continental Oil Co. 3 Ida Goodstein, SW NE SW 20-57n-99w, TD 5,910 ft., completed as a gas well in the Dakota for 5,900,000 cu. ft. per day through perf. at 5,462-72 ft. Morrison sand showed only small quantity of gas through perf. at 5,660-97 and 5,730-53 ft. New pay, other completions in Tensleep.

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SOUTHWEST TEXAS

New Gas Field Discovered In McMullen County

CORPUS CHRISTI.—New gas production for McMullen County has been opened by J. W. Gorman 1 Reiz Brothers, wildcat 20 miles northeast of Freer in A.B.&M. Survey, Section 75. Total depth is 3,175 ft. and the completion was made through perforations at 1,929-34 ft. and 1,945-50 ft. No gage is available and the well is shut in.

Mills Bennett 1 Martha Berger et al, wildcat in J. M. Uranga Grant, Ragley Subdivision, Section 19, about 2 miles southwest of Tuleta in Bee County, picked up more sand showing gas and condensate while coring ahead in the Luling at 8,142 ft. On drill-stem tests in the Slick and the Luling zones this test has already shown for gas-condensate production in both horizons. A total of 48 ft. of sand was found in the Slick and more than 40 ft. of gas-condensate sand in the Luling.

A show of gas and condensate has been reported at Atlantic Refining Co. 1 James H. Ewing, in M. L. Lopez de Herrera Grant, 3 miles southwest of Robstown, in Nueces County. Perforations are in the 7,000-ft. sand, with total depth at 8,284 ft. Details are not available.

A prospective discovery 6½ miles southeast of Falfurrias, in Brooks County, Sun Oil Co. 3-B Mrs. Mary Lasater is still trying for successful test through perforations at 4,136-46 ft. Operators have been having trouble with the swab. Casing is set at 7,147 ft.

Humble Oil & Refining Co. continues development of Tijerina field in Jim Wells County. The 23 King-Jinson, in TTRR Survey, flowed 233 bbl. per day through a ⅛-in. choke, tubing pressure 1,850 lb., gravity 40°, with trace of water. Humble has staked locations for six more tests on the King-Jinson lease in Jim Wells and Kleberg counties. They include numbers 28 through 33 and each is projected to 7,500 ft.

Falls City field in Karnes County is receiving rapid development with Southern Minerals Corp. making application for permits to drill two more tests. Each of these tests is scheduled to be drilled to 5,100 ft. to the regular field sand. The 3 Jerome Olinick and 6 Martinez Mercantile Co. are both in L. Manchaca Grant. Southern Minerals 2 V. T. Moczygemba, the most recent test in this field, flowed a potential of 135 bbl. per day through a ⅛-in. choke through perforations at 4,660-65 ft. Tubing pressure 500 lb., gravity 47°, no water, with gas-oil ratio very low. Total depth 5,015 ft.

In Willacy County 1 mile north of San Perlita, Humble 1 W. S. Murphy, a wildcat, in Gulf Coast Irrigation Co. Subdivision, Lot 13, Block 75, San Juan de Carricitos Grant, is dry at a total depth of 11,207 ft. The 5½-in. casing was set to bottom. Perforations at 9,825-32 ft. had recovered 3,650 ft. of mud, water and oil, about 30 per cent oil, but it failed to show anything of interest at the other levels tested. A series of tests were run from 10,980 ft. upward to 8,530 ft., all of which showed salt water.

The 36 locations reported this week include 7 wildcats, 3 in Live Oak, 2 in Maverick, 1 in Nueces, and 1 in Refugio counties. Kleberg County received 8 locations to take the lead this week, 6 of these starts being in Tijerina field. Of the 24 completions 9 are wildcats, all dry, 1 each in Bee, Bexar, Guadalupe, Kleberg, Medina, San Patricio, Willacy, Zapata and Zavala counties. Bee County received the greatest activity receiving 4 completions with Jim

Wells, Karnes, and Kleberg counties next with 2 each.

SOUTHWEST TEXAS WILDCAT FAILURES

Bee County: Newman Bros. and Rowan & Hope 2 Fritz Meyers, M. G. Frazier Sur. Abst. 164, 7 mi. NE of Mathis, dry at 4,261 ft.

Bexar County: Walter H. Bode and Pegg Bros. 1 H. Lowe, H. Virm Sur. 195, dry at 1,000 ft.

Guadalupe County: Cecil Hagen and D. D. Feldman 1 Paul Alves Est., John Ussery Sur., dry at 1,916 ft.

Kleberg County: Taylor Refg. Co. et al 1 R. S. Muil, Lot 6, Block 10, King Addn. 2, 6 mi. SE of Ricardo, dry at 7,515 ft.

Medina County: Ralph E. Fair, Inc., 1 G. C. McAnelly, Ed C. Durst Sur. 13, 10 mi. NW of Devine, in old Adams gas field, dry at 5,512 ft.

San Patricio County: J. K. Dorrance 1 Doris Bonorden, Coleman-Fulton Pasture Co., Sec. 3, 2 mi. SE of Sinton, dry at 6,658 ft.

Willacy County: Humble 1 W. S. Murphy, San Juan de Carricitos Gr., 1 mi. N of San Perlita, dry at 11,207 ft.

Zapata County: A. M. Lacey 1 M. Garza Est. Block 34, C. A. Douglas Subdivision of Las Comitas & Villa Grants, dry at 2,007 ft.

Zavala County: Humble 1 Marrs McLean, Mariso Aguierre Sur., 6 mi. E. of Crystal dry at 5,000 ft.

CALIFORNIA

Eocene Oil Sand Reported In Old Kern River Field

LOS ANGELES.—While the oil industry and prospectors in particular have been watching the outcome of exploration work by Richfield in the Bandini district of Los Angeles Basin and wildcat operations of Standard in the Leffingwell district, Tide Water Associated Oil Co. has been quietly drilling ahead in a basement test in the old Kern River field which was discovered in 1899. This has been drilled as a no-dope hole and for this reason very little is known by the industry in general. The results of formation tests, however, reveal the fact that Tide Water has some excellent-looking oil sand in rocks of Eocene age and the outlook for production is very encouraging. A successful completion might revive this old field and return it to a position of importance again. Tide Water is perhaps the largest holder of fee and leased acreage and for this reason will profit to the largest extent.

This important deep test in Kern River is Tide Water 154 Luck in Section 30-28s-28e. Surface location is in the center of the section, and the Santa Margarita of Miocene age was cored at 1,860 ft. The Vedder sand of Miocene age which has been found so highly productive at Mount Poso, Round Mountain, Greeley, Ten Section, Rio Bravo and other San Joaquin fields was not too good looking but might be found productive with further work. Top of the Eocene was placed at 5,900 ft. and bottom of the hole is at 5,998 ft. with 5½-in. casing cemented at 5,850 ft. The Eocene oil sand that looks so good is in the interval at 5,850-998 ft. On a preliminary water shut-off test, the well tested wet and was recemented with 100 sacks and squeezed away through 4 holes at 5,735 ft. The coring of oil sand in this well, in addition to being of paramount importance, is interesting from a drilling standpoint because of the numerous deep tests drilled at several points in the field. Possible participants, in addition to Tide Water, include Standard of California, Kern Oil Co., Westates Corp., National Oil Co., and many other small independent producers. Future drilling will be along conservative lines due to relatively large leases and fee acreage and progressive operators. Production to date has come from the so-called Kern River Series which includes all formations above the Miocene.

There has been no material change in the status of the several promising or potentially productive wildcats but developments indicate the critical period is not far away. In the La Mirada area, General Petroleum Corp., a Socony-Vacuum affiliate, is testing 1 Librown in Section 21-3s-11w. Present production is around 400 bbl. of fluid most of which is water. The high water cut present in production indicates the lower part of the hole is wet and that the upper interval tested initially is the most promising. General Petroleum has carried this well to 12,600 ft. Standard is conducting a series of tests in 1 Lewis at Leffingwell which showed up so good during drilling but which failed to produce commercially on an extensive production test. Standard will undertake further exploratory work at Leffingwell on the basis of showings found in the Lewis wildcat. Bandini is expected to be proved up as a new oil field in the very near future, possibly within the next 10 days.

There have been a number of interesting developments in the Wilmington field of Los Angeles Basin during the past few months but operators have been somewhat reluctant to disclose results of exploration work. It is known, however, that an excellent oil sand has been found below the Ford zone of Miocene age and in another well a conglomerate and weathered schist has proved highly productive. For several years it was believed that the Ford sand would be the deepest productive sand found at Wilmington as General Petroleum Corp. carried its discovery well down into the basement and found nothing below the Ford. Subsequent exploratory work has yielded two additional productive intervals

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below the Ford. It now remains to be determined how extensive the new sands will be.

The new year has started off with a bang and indications point to the probability of an aggressive exploratory program but a somewhat lower development program in older fields. Those in close touch with California conditions are of the opinion that crude oil production should be reduced at once and there appears ample justification for this belief. If present conditions continue, the projected weakening in crude oil prices and gasoline demand will be very evident shortly. If conditions progressively grow worse, drilling operations may be affected and drilling reduced. A subnormal number of new locations for the past several weeks indicates a probable reduction in development work.

CALIFORNIA WILDCAT FAILURES

Kern County, Antelope Hills: Hancock Oil Co. 1 Mabry, 36-26s-18e, bottomed in hard gray shale. Expected oil sand in Miocene was absent, no important showings were logged, TD 1,375 ft.

Edison: Independent Exploration Co. 1 Mettler, 19-30s-30e, bottomed in granite, no showings, TD 1,659 ft.

Gosford: Rothschild Oil Co. 56-12 K.C.L.-A, 12-30s-26e, bottomed in gray sand, top Stevens oil zone of Miocene age 6,684 ft., poor oil sand cored at 6,684-6,701 ft., TD 7,030 ft.

Jasmine: Fred Goodstein 1 Hart, 25-25s-26e, bottomed in gray sand, no showings worth testing, TD 4,213 ft.

Round Mountain: H. E. Havenstrite 1 Skelton, 11-28s-28e, bottomed in gray sand. Vedder sand at 2,650 ft. was barren, TD 2,676 ft.

Los Angeles County, Oak Canyon: Western Gulf 1-B Stevens, 5-4n-17w, bottomed in gray sand, tested wet, TD 9,231 ft.

Santa Barbara County, Carpinteria: Western Gulf 1 Bryce, 30-4n-25w, bottomed in barren gray sand, only minor showings, TD 3,930 ft.

KANSAS

Two Pools Extended in Rice and Russell Counties

THE Mahoney pool of Russell County has been given an extension in its third producer since its discovery in 1940. The extension, Royer and Farris 1 Mahoney, SE SE SE 8-14-12w, will probably cause a renewal of drilling activity in that area. The well correlates about level with the other two, with the Lansing top at 2,935 ft. Perforations were made at 2,968-76 ft., and the well swabbed and flowed 25 bbl. per hour after acid treatment.

Lauck-Moncrief 1 Logan, SE SW SE 12-20-10w, has been completed as an oil well from the Arbuckle to extend the Chase pool three-fourths of a mile west. The hole filled with oil and operators are installing pumping equipment to produce the well.

Cowley County.—Hartman and B. B. Blair 1 Smith, SE SE SW 15-33-3e, wildcat discovery, is waiting on potential after swabbing 2½ bbl. of oil per hour.

Kingman County.—Skelly Oil Co. 1 Miles "G," CNL N/2 SE 30-27-10w, in the Cunningham pool, is reworking. The well was completed in 1940 as a gas well with 53,000,000 cu. ft. of gas. Operators recently perforated in the Lansing at 3,474-82 ft., and 300 ft. of fluid rose in the hole in 25 minutes, 50 per cent of it oil. Bailing through casing yielded ¾ bbl. per hour of fluid, 50 per cent oil.

Phillips County.—Helmerich & Payne, Inc., 1 Bowman "A," NW NW SE 3-5-20w, discovery prospect, is plugging back to the Arbuckle after finding water in the Reagan sand. The well earlier tested oil in the Lansing at 3,150 ft., and the Arbuckle showed good saturation at 3,380-87 ft. Cas-

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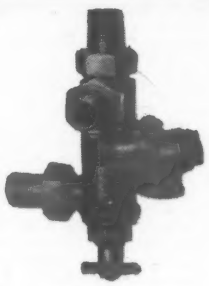

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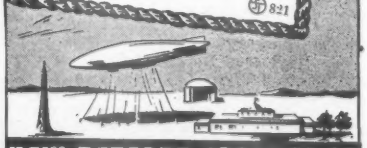

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ing will be perforated at approximately that zone in the Arbuckle.

Sedgwick County.—Beech Aircraft 1 McLean, NW SE NW 1-27-1e, has run into trouble with crumbling shale and is cleaning out. The well had an estimated 75 bbl. of oil per day from pay zone at 2,975-77 ft.

Trego County.—Sohio Oil Co. 1 Schaeffer, NE NE NW 11-12-21w, wildcat, is testing the Arbuckle at a total depth of 4,054 ft. In 6 hours, 300 ft. oil and 1,000 ft. water rose in the hole.

PERMIAN BASIN

Basal Permian Shows Oil In Ector's Addis Pool

MIDLAND.—Stanolind Oil & Gas Co. 1 Eva B. Kayser, Section 34, Block 43, T-2-S, T&P Survey, deep test on the southwest edge of the old Addis pool of Ector County, made a 2-hour drill-stem test in the basal Permian from 8,496 to 8,560 ft. Recoverey was 1,550 ft. of black sweet oil and 90 ft. of slightly oil-cut drilling mud. Operator was drilling ahead.

The Texas Co. 1-D Fraser, Section 27, Block 45, T-1-S, T&P Survey, 1⅛ miles southeast extension to Ellenburger production in the TXL field, Ector County, ran a drill-stem test from 10,925-75 ft., the fifth test of the Ellenburger, and recovered 500 ft. of free oil and 3,200 ft. of sulfur water. Electric log will be run. Texas 29 Connell, Section 9, Block B-16, Public School Lands Survey, wildcat 1½ miles northwest of the Penwell (San Andres) field, Ector County, acidized with 500 gal. of mud acid through perforations from 9,600-20 ft. and swabbed 3 bbl. of sulfur water per hour. Ellenburger was topped at 9,525 ft. Operator was preparing to perforate from 9,540-70 ft. Stanolind 3-Q Scharbauer, Section 12, Block A, Public School Lands Survey, wildcat on the north end of the Goldsmith pool, Ector County, perforated with 220 shots from 7,505-60 ft. and swabbed 9½ bbl. of fluid in 7 hours, 75 per cent oil and 25 per cent basic sediment. After acidizing with 2,500 gal., operator will continue testing.

Crane County.—Atlantic Refining Co. 1-G University, Section 39, Block 31, University land, promising to be the second Devonian producer in the Block 31 pool of eastern central Crane County, recovered 5,288 ft. of oil on a drill-stem test from 8,665-8,788 ft. On a later drill-stem test from 8,785-8,895 ft., the test flowed water cushion and oil and gas-cut mud for 20 minutes. When 41 stands of pipe were pulled, it headed oil and gas-cut mud and unloaded when an additional 86 stands had been removed. It flowed for 12 minutes. Operator was drilling ahead. Sid W. Richardson 1 Dawson, Section 2, Block 139, A. Brigance Survey, wildcat 8¼ miles northwest of McCamey, ran a 105-minute drill-stem test in the Devonian from 5,730-80 ft. and recovered 330 ft. of drilling mud slightly gas-cut and with an odor of oil. It was being drilled deeper. Humble Oil & Refining Co. 1 Cowden, Section 35, Block X, CCSD&RGNG Survey, wildcat 2 miles northwest of Crane-Cowden shallow pool, after treating with 2,000 gal. of acid through perforations from 6,100-30 ft., swabbed 52.96 bbl. of oil load and 160 bbl. of fluid, 99 per cent water and 1 per cent basis sediment the first 12 hours. Operator continued swabbing to clean out.

Andrews County.—Magnolia Petroleum Co. 1-A Cowden, Section 7, Block A-55, Public School Lands Survey, ¼-mile west offset to the opener of the Dollar Hide pool, flowed 65 bbl. of oil in 11 hours through perforations from 7,974-8,015 ft. The well was killed with oil and preparations were being made to reperforate from 7,957-74 ft. and test.

Fullerton field, Andrews County, and Garza field, Garza County, each reported seven completions this week while Slaughter field, Cochran County, had four and TXL field, Ector County, had seven. The TXL field has the most active drilling program with 27 drilling wells. The Fullerton field has 22, Block 31 field, Crane County, has 13; Tood Deep, Crockett County, 6; Welch field, Dawson County, 7, and Keystone-Holt field, Winkler County, 8. There are seven new locations in the TXL field, four in the TXL-Devonian and three in the TXL-Ellenburger, and five in the Fullerton field.

WEST TEXAS SUCCESSFUL WILDCATS

Andrews County: Extension to old oil pool—Mid-Continent 3-11 University, Sec. 29, Blk. 13, University, Fullerton-Ellenburger pool, elev. 3,291 ft., flowed natural 1,974 bbl. day through ¾-in. choke on 2-in. tubing, perf. 10,580-630 ft. Ellenburger, gravity 40.1°, gas-oil ratio 314, TD 10,696 ft.

Howard County: New oil pool—Bruce C. Clardy 1 fee, Sec. 4, Blk. 33, T-1-N, T&P Sur., 8 mi. NW Big Spring, elev. 2,569 ft., pumped 28 bbl. day through 2-in. tubing, perf. 3,100-51 ft. Clear Fork, gravity 28.3°, TD 3,560 ft.

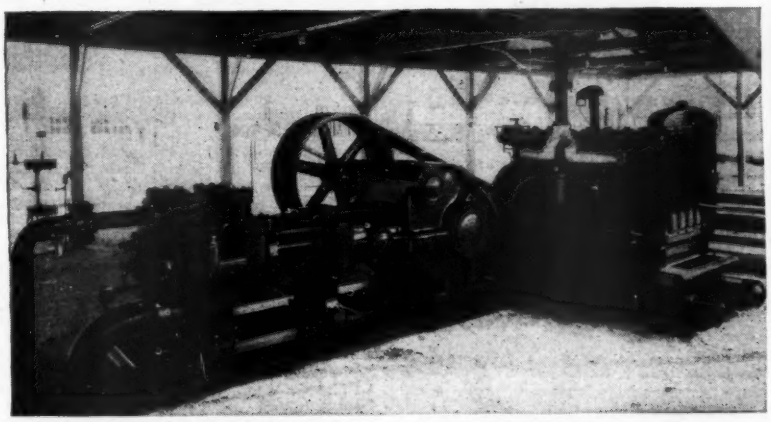
Upton County: Extension to old oil pool—Gulf 1-D G. E. Farley et al, Sec. 12, Blk. 3½, CCSD&RGNG Sur., 1 mi. N McCamey pool, elev. 2,576 ft., pumped 143 bbl. day through 2-in. tubing, perf. 2,290-2,358 ft. Yates, gravity 33.7°, gas-oil ratio 287, TD 2,358 ft.

WEST TEXAS WILDCAT FAILURES

Crane County: Gulf 7-E M. B. McKnight, Sec. 9, Blk. B-21, PSL Sur., 1 mi. W McKnight pool, elev. 2,681 ft., Ellenburger 6,080 ft., dry, TD 6,126 ft.

Fisher County: Texas 1-C D. W. Stephens, Sec. 82, Blk. 1, H&TC Sur., 7 mi. E Rotan, elev. 1,935 ft., Gunsight 3,996 ft., dry, TD 6,326 ft.

Garza County: J. R. Dunaway 1 Post estate, Sec. 11, Blk. 5, K. Aycock Sur., 2 mi.



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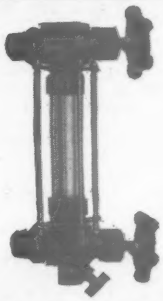

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W Post, elev. 2,711 ft., dry, TD 3,121 ft.

Lamb County: Humble 1 A. M. Arnold, Sec. 120, Blk. A, R. M. Thompson Sur., 1 mi. W Anton pool, elev. 3,441 ft., Jackson 5,365 ft., dry, TD 6,002 ft.

Pecos County: Helmerich & Payne 1 Barnes, Sec. 130, Blk. 10, H&GN Sur., 3 mi. SE Fromme, elev. 2,455 ft., dry, TD 4,687 ft.

Runnels County: E. M. Wahlenmaier et al 1 J. W. Barr, C. Montez Sur. No. 230, 10 mi. SW Talpa, elev. 1,656 ft., Ellenburger 3,705 ft., dry, TD 3,807 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Rumble Oil & Refining Co. 1 Cooper, 33-24s-37e, an old shallow well in the Cooper-Jal field, Lea County, now being deepened, ran a 1-hour drill-stem test from 6,817-46 ft. and recovered 90 ft. of oil and gas-cut mud. Core from 6,904-07 ft. recovered lime, chert and dolomite with a slight show of gas. The test was being drilled deeper.

Continental Oil Co. 1 Mullis, 21-15s-29e, wildcat in southern Chaves County, was setting cement plug with total depth of 5,073 ft. in the Clear Fork. On a 90-minute drill-stem test from 4,515-40 ft., recovery was 90 ft. of drilling mud with no shows of oil, gas or water.

Humble 8 Greenwood, 9-22s-37e, south offset to Neville G. Penrose, Inc., 1 Federal-Penrose, Ellenburger discovery in the shallow Penrose-Skelly field of Lea County, flowed 45 bbl. of oil in 1 hour after being connected with storage on a drill-stem test from 8,083-8,150 ft. Magnolia Petroleum Co. 9 Argo-Brunson, 9-22s-37e, northeast offset to the discovery, was drill-stem testing between 7,658-7,881 ft. The section from 7,675-7,760 ft. had light porosity and oil stains. There was good porosity and stains from 7,785-95 ft. With elevation of 3,436 ft., the outpost topped the Ellenburger at 7,675 ft.

The Grayburg-Jackson field, Eddy County, reported three completions and the Drinkard area, Lea County, two. Lea County has 56 drilling wells with 7 wildcats. Eddy County has 51 with 15 wildcats. The Paddock and Penrose-Skelly field, Lea County, each have two new locations.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

DeBaca County: A. D. Engle & Co. 1 State, 8-3s-26e, Glorietta 1,827 ft., dry, TD 1,831

LA.-ARK.

Lake St. John Adds Three Oilers, One Gasser

SHREVEPORT.—Four wells were completed in the Lake St. John field of Concordia Parish, three oil wells, and one gas well. The California Co. completed all four of them. Three oil wells made a combined initial production of 825 bbl., and the gas well was good for 3,500,000 cu. ft. of gas. The Big Creek field of Richland Parish added two oil wells, completed by American Liberty Oil Co. and R. T. Sellers, for a combined initial of 932 bbl.

In the Arkansas fields, four completions were announced, including two oil wells and two dry holes, one of which was a wildcat. The two oil wells were completed in Stephens and Fouke fields.

NORTH LOUISIANA SUCCESSFUL WILDCAT

Franklin Parish: New oil pool—Atlas Oil Refining Co. 2 Baker, SW SE 27-16n-9e, 145 bbl., TD 4,940 ft.

NORTH LOUISIANA WILDCAT FAILURES

Concordia Parish: S. M. Richardson B-1 Madison Oil & Development Co., 4,240 ft. south and 1,716 ft. east of NW corner of 16-6n-8e, dry, TD 6,559 ft.

Franklin Parish: C. L. Smith 1 Mitchell estate, SE SE 28-11n-7e, dry, TD 8,062 ft.

Red River Parish: C. W. Robinson and H. L. Woods 1 Long Bell Lumber Co., SW NW 8-12n-8w, dry, TD 6,215 ft.

ARKANSAS WILDCAT FAILURE

Ouachita County: Jack Carnes 1 Reynolds & Sifford, 760 ft. east and 60 ft. north of SW corner of SE SW 8-14s-16w, dry, TD 3,051 ft.

CANADIAN FIELDS

Preparations for Record Shot Nearing Completion

CHATHAM.—Preparations are nearing completion for the big shot to be set off by Oil Reflow, Ltd., in West Flank 2 well in South Turner Valley. The hole has ben cleared and packer set and a simulation of the test with water showed everything working perfectly. A shot of 5,000 quarts of nitroglycerin is being set off in the Madison limestone with a view to breaking up the formation on an extensive scale and bringing back large production.

Brazeau.—In the Brazeau area of the Central foothills, Home-Brazeau 1, LSD 5, 17-43-17w5 which faulted from the Madison limestone at 9,597 ft., got a second Dalhousie sand contact at 10,763 ft., and is expected to reenter the Madison at around 11,500 ft., with completion around 12,000 ft.

Steveville.—In the Steveville-Princess field east of Calgary, P.S.& D. 1, LSD 2, 3-20-12w4, finished at 3,420 ft., showed water in a test of the basal lower Cretaceous, and plugged back for a combined test of the basal Colorado and upper Blairmore formations at 3,348 ft., where it is being finished as a gasser. Some upper horizons may also be tested. Farther south and east Princess-C.P.R. 38-31-19-11, LSD 15, 31-19-11w4, finished dry at 4,114 ft., after testing the Devonian limestone.

Stolberg.—In the Stolberg area of the central Alberta foothills, south and east of the Brazeau structure, Imperial-Shell-Stolberg 1, LSD 3, 22-18-5w5, is developing another deep test, deepening below 10,440 ft., after getting the Blairmore contact at 9,650 ft.

Turner Valley.—With 10 wells drilling or located, Turner Valley activity may be cut in half within a few weeks as a result of impending completions. In North Central Turner Valley, Royalite Oil 85, LSD 3, 2-20-3w5 is finishing after getting limestone contact at 8,194 ft., and in the north area Royalite-Lowery 4, LSD 13, 11-20-3w5, got Madison at 7,766 ft. In the north extension, Foothills Oil & Gas 23, LSD 3, 9-21-3w5, an east flank well, got the limestone at 8,335 ft. Beyond the most northerly producer, Home Oil 20, LSD 7, 24-21-4w5, is in the upper porous after limestone contact at 9,303 ft. while Home 21, LSD 11, 34-21-

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3w5, the extreme outpost well several miles farther northwest, is in Kootenay below 9,392 ft., and nearing the limestone. Three other wells are in upper horizons and two new locations have been staked.

Lethbridge.—In the Lethbridge area, southern Alberta, Imperial-Lethbridge 1, LSD 3, 10-8-22w4, encountered water in the upper porous zone of the Madison but is deepening below 4,700 ft. Imperial-Lethbridge 2, LSD 15, 35-7-22w4, is below 3,323 ft.

OKLAHOMA

Second Producer at West Billings Completed

DEEP ROCK OIL CORP. et al 1 Mehew, SW NW NW 20-23n-2w, ¼ mile east of the Wilcox sand discovery well of the new West Billings field of northwestern Noble County, has been brought in as a flowing producer. After the 7-in. plug was drilled out at 4,440-54 ft., the well cleaned itself and flowed for a brief period into the pits. Flow was then directed into tanks and the well flowed steadily at the rate of 45 bbl. an hour with 200 lb. back pressure on the tubing. The 1 Mehew is the second producer in the field and Deep Rock, Burke-Greis Oil Corp., and Mid-Continent Oil Corp., owners of the 2 wells, have staked location for 2 White in NE NE NE 19-23n-2w. This is a north offset to the 1 White, discovery well, which came in for 25 bbl. of oil an hour late in 1945.

The West Moore pool of northern Cleveland County was successfully extended to the northwest at the close of the past week by Skelly Oil Co. 1 Divis, SE SE NW 30-10n-3w. The 1 Divis was drilled to 8,859 ft., below the Wilcox sand and plugged back to 8,825 ft. After it had been perforated in several zones of the dolomite and sand, the well started off at 15 bbl. per hour, and in a 20-hour period made 387 bbl. of oil through a 1-in. choke. Shut in for 12 hours, it was reopened for 40 minutes and flowed 30 bbl. of oil in the brief period, registering 750 lb. pressure on the tubing and 450 lb. on the casing. Operators then shut in the Divis with plans to reopen it early this week for a more definite production test.

Carter Oil Co. has completed its 1 C. W. Mottinger, NW NW 5-6n-3w, McClain County discovery well, for a good producer. Drilled to a total depth of 11,230 ft., the 1 Mottinger was plugged back to 10,940 ft. and completed in the Bromide section at 10,812-10,922 ft. with 7-in. casing set at 10,815 ft. It flowed 686 bbl. of 40.7-gravity oil in 16 hours through chokes as follow: 192 bbl. in 2 hours through ½-in. choke; 15 bbl. in 1 hour through ¼-in. choke; 261 bbl. in 2 hours through 1-in. choke and 217 bbl. in 11 hours through ¼-in. choke. Carter is at present digging pits for an offset, 1 Mary Mottinger in NW SW 5-6n-3w.

(Continued on page 140)

MISSISSIPPI

Brookhaven Field Adds 5-Bbl.-Per-Hour Well

JACKSON.—The Brookhaven field of Lincoln County is adding another oil well in the Roeser & Pendleton 1 Smith, NW SE 8-7n-7e. Perforations were made at 10,222-228 ft. and 10,308-322 ft. in two thin sand zones, and a drill-stem test flowed at the rate of 5 bbl. of pipe-line oil per hour through a 5/32-in. top choke. Tubing will be run on the packer to take production test.

In Choctaw County, Alabama, the Gilbertown field has another producer, Carter Oil Co. 1 Alman unit No. 1, SW SE NE 5-10n-3w, pumped at the rate of 41 bbl. of 17-gravity oil and 5 bbl. salt water in 24 hours. This well brings to 24 the number of producers in the field.

Only two completions were made in Mississippi during the week, being two oil wells, one in Baxterville and one in Cranfield. Nine new field locations were announced, with no wildcat starts. Locations were spotted in Baxterville, Eucutta, Fayette, Gwinville, East Heidelberg, West Heidelberg, and Hub fields.

ALABAMA WILDCAT FAILURES

Mobile County: Danciger Oil & Refining 1 Giesler, NE SW 8-4s-2w, dry, TD 8,530 ft.

FLORIDA WILDCAT FAILURE

Charlotte County: Humble 1-A Lownes-Treadwell, 30 ft. south of center of SW NE 17-42s-23e, dry, TD 10,300 ft.

MICHIGAN

Gratiot County Well Flows Oil From Traverse

SAGINAW.—The Elba-Ashley district of Gratiot County seems to have a commercial Traverse producer in the A. E. Williams 1 Krahl, SE NE SE 15-9n-1w. The well produced about 300 bbl. the first four days on a test through the casing. It flowed 79 bbl. the first day and has been flowing by heads since. The well shows a comparatively high volume of gas and will probably be produced through tubing to steady the flow.

Chartiers Oil Co. 1 Diehl, N/2 SW NW 29-15n-6w, about 1 mile northwest of the Sherman field, Isabella County, showed an estimated 2,000,000 cu. ft. of gas at 1,448-55 ft. in the Stray sand. Operators are drilling ahead.

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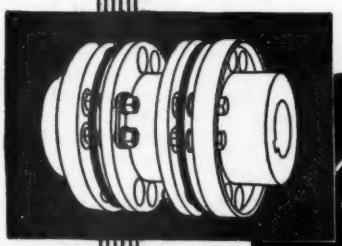

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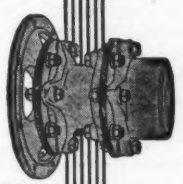

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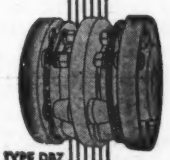

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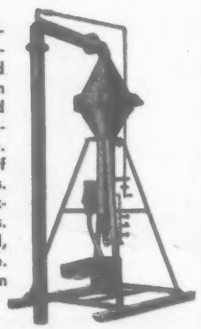

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Among the

Drilling Contractors

John O. Farmer, for 11 years field engineer and general sales manager for Otis Pressure Control, Inc., Dallas, resigned January 1 to become a partner and general manager in the newly created drilling company of **Jones, Shelburne & Farmer, Inc.** Officers of the new drilling firm are Fred Jones, president; Farmer, vice president, and Sam P. Shelburne, secretary-treasurer. The firm plans to put into operation a number of rigs in the immediate future. General headquarters will be maintained in Oklahoma City.

Lt. F. M. Stevenson has been discharged from active duty after 31 months of Naval service. He recently completed an 18 months' tour of duty as air engineering officer aboard the escort carrier USS Kitkun Bay which gave air cover to several Pacific Island invasions. During this assignment he received the Bronze Star Medal, the Presidential Unit Citation, and five battle stars. Prior to joining the Navy "Steve" was with Phillips Petroleum Co. for 10 years and was assistant division production superintendent at Oklahoma City upon enlistment. He is now organizing Signal Oilfield Service and has two cable-tool drilling-in and reconditioning units on order. The new company expects to have its services available around March 1. Field operations will be directed out of Great Bend, Kans. Headquarters will be located in Tulsa.

O'Rourke-Baker Drilling Co., Tulsa, has obtained a drilling contract for the B. B. Blair et al 1 Lester, in Cowley County, Kansas, and is drilling at 1,900 ft. Contractors have completed the W. L. Hartman and O'Rourke-Baker 1 Smith, in Cowley County, about 1 mile east of the Rainbow Bend field, and the well has been placed on production. It is producing from the Bartlesville sand at a depth of 3,260 ft. After filling the two 250-bbl. tanks a gage was taken and it was averaging 75 bbl. per day of clean pipe-line oil. The well is in SW SW SW 15-33s-3e. The 1 Lester is a south offset.

Association Issues Manual Of Accounting Practices

American Association of Oilwell Drilling Contractors has released to its member contracting firms a Manual of Uniform Accounting Practices for the drilling industry, prepared by its committee on accounting, and published and distributed by the association.

This book is the first complete accounting text to be released in which the principal interest is centered on accounting for the true cost of drilling oil and gas wells. Ample provision is made in the account structure, however, to accommodate activities other than drilling.

The manual sets out recommended practices for breaking down drilling costs into simple and logical divisions as a basis for developing accurate average cost factors. By extension charts and record forms, it illustrates how drilling costs may be systematically and consistently accumu-

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lated in any degree of detail desired by the contractor.

Accompanying the accounting manual is a companion volume, the Costing Guide. In this volume the committee, with the cooperation of supply and service companies, has listed, in alphabetical order, every item of supply material and repair and replacement part to which reference could be found. These items are keyed to the account numbers appearing on the well cost extension charts in the accounting manual, with blank columns for inserting an operator's private account code. This arrangement enables the distribution clerk to charge items of well cost to the proper expense account, even though he may not be familiar with the nature of the items or its use.

Frank E. Stickle, Tulsa, has the contract for Sunray Oil Corp. 2 Josephine, W/2 NE NW 11-14-20w, south of the Pleasant pool of Ellis County, Kansas.

Roberts Drilling Co., Abilene, Tex., has the contract for R. F. St. John et al 1 Estes, 4 miles northwest of Clyde, 330 ft. from the west and 1,650 ft. from the south lines of Section 55, BBB&C Survey, Callahan County, Texas.

John O. Farmer will enter the drilling contractor business as a partner of Jones & Shelbourne. The new firm will be known as Jones, Shelbourne & Farmer, and Farmer will be in charge of field operations in Oklahoma, Kansas, and Montana. Farmer resigned as manager of marketing and sales for Otis Pressure Control, Inc., to join the drilling firm.

Soviet Reports Another Rich Producing Structure

Drilling in the Krasnokamsk area (Molotov Oblast) of the Soviet Union resulted in a well producing 170 metric tons (about 1,200 bbl.) of oil per day, according to the Soviet press. The new reservoir, known as Severokamsk, is near Krasnokamsk (to which it is connected by pipe line) and with it forms the northern part of the Second Baku. This region is one point of a large triangle, the other two being Syzran and Tuimazy. Considerable deposits of Devonian oil have been found at all three points.

Dorion Brothers Get Oil Concession in Guatemala

GUATEMALA. — The Government of Guatemala has granted to Dorion Brothers a concession to explore 245,000 acres of national land for oil. Another applicant was refused a similar concession.

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PERSONALS

Career Veered From Railroading to Oil By Accident

J. H. DUNN, recently elected president of Shamrock Oil & Gas Corp., entered the oil industry by accident, according to his own assertion, but has had a highly successful career.

He had tentatively chosen the engineering phase of railroading as his vocation when, at a friend's suggestion, he applied for employment with Lone Star Gas Co. in Dallas. Since that start in January 1926, his entire interest has centered in producing and other phases of the oil and gas industry. He rose rapidly with Lone Star and when he left that organization in 1939, he held the position of chief production engineer.

From Lone Star, Dunn went to the Shamrock organization which at that time was undergoing some changes in executive personnel. He held the position of vice president and general manager until his recent election as president, and has been instrumental in developing it into one of the strongest independent oil companies in the Southwest.

Dunn is a firm believer in keeping pace with technical developments, and he maintains close contact with associations and scientific groups in the industry. He believes that changes which are now taking place will completely alter the character of products manufactured from natural gas and natural gasoline and in their application to requirements of the industry.

Dunn was born in Dallas, County, Texas. He attended Dallas public schools and Texas A. & M. College where he received his degree in mechanical engineering.

Herman Wachsman, during the war a U. S. Army petroleum coordinator for the Philadelphia port area, has been presented with the Exceptional Civilian Service Award for "untiring and constant efforts" in the shipment of petroleum products to the European war theater.

James Austin, Oklahoma Natural Gas Co., was elected head of the Shawnee, Okla., check meeting of scouts for the first half of 1946. **Fred Jackson,** Phillips Petroleum Co., was renamed secretary-treasurer.

Frederic R. Pratt, since 1940 in the distribution department of Socony-Vacuum Oil Co. and during the 9 years before that in the marine transportation department, has been made general manager of the latter department. He succeeds **Charles H. Kunze,**

F. R. PRATT

C. H. KUNZE

who retired after 41 years' service with the company. Pratt served in the Coast Guard during World War 2 and held the rank of lieutenant commander upon his discharge. He is an Amherst graduate. Starting with the company (then Standard Oil Co.) in 1904 as an office boy, Kunze worked his way up, serving in various capacities. During the recent war, his experience in shipping resulted in the Government calling on him for valuable tanker information. He served as executive vice president and director of War Emergency Tankers, Inc. He was also a member of the oil industry's supply and transportation committee in District 1.

Dr. Frank B. Counselman, discharged from military service, is now a geologist for Great Lakes Carbon Co. and is stationed at Abilene, Tex. Before the war he was with Gulf Oil Corp. in Texas.

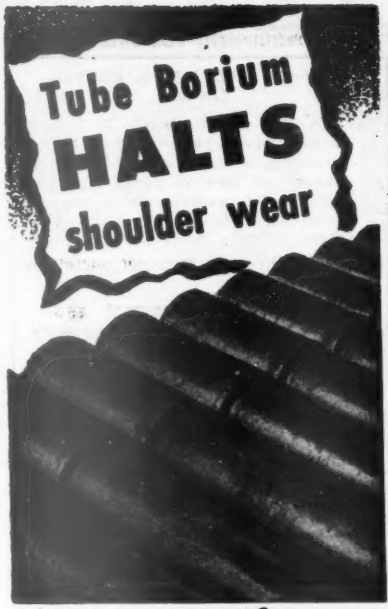
Louis D. Mann has been made vice president and general manager of Cities Service Refining Corp. at Lake Charles, La. Before becoming manager of the Maumelle Ordnance Works during the war he was general superintendent of refineries for Cities Service.

Maj. Jack I. Laudermilk, returning to civilian life after more than 4 years' service in the Army, has been made head of the department of petroleum engineering at New Mexico School of Mines. He served overseas in the European theater of operations as an intelligence officer and is a veteran of the battles of Northern France, Ardennes, Rhineland, and Central Europe. Following V-E Day he was military summary court officer of the city of Nordlingen, Germany, with the Army of Occupation. Before the war Major Laudermilk was a petroleum engineer in the Mid-Continent and later a faculty member of University of Texas.

C. B. Russell and **Floyd F. Dobbs** are in charge of a production division established by Ashland Oil & Refining Co. at Henderson, Ky. **C. H. Duncan** heads a similar division established for the Illinois-Indiana area, with his office at Grayville, Ind.

Robert W. Hird, formerly a lieutenant colonel in the Army, has rejoined Continental Oil Co. at Ponca City, Okla., as assistant manager of sales operations. Just before being discharged Hird, as chief of the ordnance planning branch, research and development division, Army Service Forces, received the Army's Legion of Merit award for outstanding service in development of the "weasel," officially known as Cargo Carrier M29C. Colonel Hird, an engineering graduate of the University of Nebraska, joined Continental immediately after receiving his degree in 1934.

Harry Myers, of Vermilion, Alberta, left Calgary recently by plane for



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Trinidad, where he will be employed by Asiatic Petroleum Corp. in development work, under a 3-year contract.

John C. Walker, formerly general superintendent of chemical operations for Cities Service Oil Co. (Del.), has been appointed director of chemical research. Walker, a graduate of Washington University, joined Cities Service in 1917.

Lt. Comdr. O. K. Baker has rejoined Shell Oil Co., Inc. in Houston as supervisor of insurance and claims for the Texas-Gulf area, following 4 years' service in the Navy. An Annapolis graduate, Baker was Shell's West Texas representative in insurance and claims when he was called to active duty in April 1942.

D. F. Sears, since June 1942 chief of the pipe-line section, transportation division, Petroleum Administration for War, has returned to Shell Pipe Line Corp. at Houston to fill a newly created position, that of assistant to the vice president. Sears joined the company in 1927 as an engineer, and 6 years later was named assistant manager. In 1939 he was made general superintendent.

R. A. Brannon, senior corrosion engineer for Humble Pipe Line Co., has been named assistant to the assistant general superintendent of the company, replacing **R. J. O'Connell** who resigned to join Oklahoma Contracting Co. Brannon will continue his duties as senior corrosion engineer in addition to those of his new post. A graduate of the University of Texas, he has been with Humble Pipe Line Co. since 1928.

Eugene P. Bowler, of Bradford, Pa., a lieutenant commander in the Navy during the war, is now field engineer for Pennsylvania Grade Crude Oil Association in the production research department in Bradford. Bowler was in charge of the Sloan & Zook Co. oil laboratory in Bradford before entering the Navy in 1941. His concluding Navy assignment was as technical petroleum officer aboard a warship in the Pacific area. Bowler received a B.S. in petroleum engineering from Pennsylvania State College in 1937 and an M.S. in 1938.

F. W. Oudt has been transferred from Saginaw, Mich., to Houston, and promoted to senior geophysicist for Shell Oil Co., Inc. At Saginaw Oudt was chief seismologist for the Michigan division of Shell's Mid-Continent area. Joining Shell in 1926, Oudt was in charge of a seismograph crew for 5 years. Later he supervised crews in the Mid-Continent area, and from 1936 to 1943, he was in charge of geophysical work in Illinois, Kentucky, and Indiana.

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FOR SALE: Late model practically new 225 H.P. 8 cyl. Le Roi motor with 4 cyl. starting motor. Mounted on skids with extended shaft and 12 groove D section pulley and 12 new 330 D section V-belts. Daniel Drilling Co., 708 Daniel Building, Tulsa. Oklahoma. Phone 2-6408.

FOR SALE: No. 3 National Drilling Machine, steel mast and steel sills—145 H.P. Hercules Diesel Drilling motor with Young reverse clutch—motor rebuilt—new sleeves, pistons, bearings, rebuilt crank shaft—A-1 condition. Price $5,000. Carper Drilling Company, Artesia, New Mexico.

FOR SALE: One Wilson Mogul Rig complete all friction drives. 2—D 13000 Caterpillar diesel engines, complete with all accessories and 87 ft. Lee C. Moore mast. The rig can be inspected while running. P.O. Box 497, Tulsa, Oklahoma. Phone 3-2882.

FOR SALE: 2 RXIV Le Roi 8 Cylinder 6¾"x7" 225 HP. Engines completely overhauled with starting engines with or without twin disc clutches. Jack Gwynn Company, Ltd., Phone 6196, Wichita Falls, Texas.

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10—5000 Bbl. Black, Sivalls & Bryson Bolted Tanks, 24'1⅛" high x 38'7⅝" diameter, 3 rings, 1st ring 7 gauge, balance of tank 10 gauge, complete with bolts, gaskets, wrenches for erection — crated for export — FOB Ogden, Utah — Immediate delivery.

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